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# ANNALS of SURGERY

A Monthly Review of Surgical Science and Practice

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# ANNALS of SURGERY

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## THE HANDLING OF EARLY AND DOUBTFUL CASES OF CANCER\*

By ROBERT B. GREENOUGH, M.D.  
OF BOSTON, MASS.

IN January, 1917, the Cancer Commission of Harvard University offered to supply to the medical profession of Massachusetts the services of their laboratory for the free diagnosis of suspected cancer tissue. This offer was made at the instigation of the Committee on Cancer of the Massachusetts Medical Society, and was in accordance with the movement which originated in the American Society for the Control of Cancer for the provision of facilities for free diagnosis of cancer tissue, throughout the country, and based upon the report of a Committee of that Society composed of Dr. James Ewing of Cornell, Dr. F. C. Wood of the Crocker Fund, and Dr. L. D. Bristol, published in the *Journal of the American Medical Association*. In that report the concluding recommendation "D" reads as follows: "Judgment must always be used by surgeons in the removal of cancerous tissues for diagnosis, and the value of the microscopic diagnosis should appear to outweigh the risk involved before such a procedure is adopted." I fear that the wise caution here expressed has not always been followed in the removal of tissue for diagnosis.

The offer of free laboratory service was made to the Health Commissioner of Massachusetts, and was accepted by the Health Commissioner, Dr. A. J. McLaughlin, subject to the issue of such rules and suggestions, to be issued to the profession at the time of the announcement of the service, as should be deemed advisable by the Commissioner of Health and by the Cancer Commission of Harvard University.

In the preparation of these rules and suggestions the writer at once became aware of the fact that a considerable part of the medical profession held strong views, and views which were not always in agreement, upon the subject of the propriety of the excision of fragments of tissue for pathological diagnosis in cases of suspected cancer. At about this time the announcement of a similar service for the free diagnosis of pathological material was made by the Health Commissioner of New York City, and a storm of criticism immediately arose in the medical publications of that city. Under these circumstances the writer ventured to prepare the circular letter dated March 20, 1917, copies of which were sent to all of the fellows

\* Read before the American Surgical Association, June 2, 1917.

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of this Association, and to the members of the Clinical Surgical Society, the American Gynaecological Association, the members of the American Association for Cancer Research, and the Directors of the American Society for the Control of Cancer. The letter is as follows:

10 GLOUCESTER STREET, BOSTON.

March 20, 1917.

DEAR DOCTOR:

The American Society for the Control of Cancer has placed itself on record as favoring the institution of free diagnosis of pathological material throughout the country. In so far as this movement provides for the examination of material removed by radical operations, performed for the cure of cancer, there is no room for adverse criticism. So far, however, as it applies to the excision of small pieces of suspected tissue in order to establish a diagnosis, its wisdom has been the subject of some discussion. This circular letter is sent to the members of the American Association for Cancer Research, the American Surgical Association, and the American Gynaecological Association, in order that a collective opinion in regard to the safety of procedure in specific cases may be obtained. Will you be kind enough to state whether or no you approve of the procedure indicated in the following list of lesions, and if you do not approve, will you be kind enough to state your opinion as to what procedure should be recommended? Please bear in mind the fact that an immediate frozen section diagnosis of suspected material is not in question, but that these recommendations have to do with the removal of suspected tissue, and its shipment to a laboratory, for diagnosis, involving a delay of at least a week before the pathological report can be obtained. Bear in mind, also, that the question has to do only with early and doubtful cases in which a positive diagnosis of cancer cannot be established with sufficient certainty to justify radical operation.

Trusting that the importance of the matter justifies the amount of trouble involved in answering these queries and with cordial thanks for your co-operation, I am

Very truly yours,

ROBERT B. GREENOUGH.

PROCEDURE RECOMMENDED IN THE DIAGNOSIS OF EARLY AND SUSPECTED  
CANCER OF DIFFERENT ORGANS

(1) *Lesions of the external skin.* If small, complete excision of the lesion. If large, excision of a portion of the growing edge of the lesion, followed by cauterization.

(2) *Lesions of the lip.* If small, V excision, with a good margin, of the whole lesion. If large, excision of a portion of the growing edge of the lesion, followed by cauterization.

(3) *Lesions of the tongue.* Excision of the whole lesion, or if large, excision of a portion of the growing edge, with cauterization.

(4) *Lesions of the palate, tonsil and the buccal mucous membranes.* Excision of the margin of the lesion, and cauterization.

(5) *Lesions of the œsophagus.* œsophagoscopy, and excision of the margin of the lesion.

(6) *Lesions of the stomach.* Pylorectomy; gastrectomy, or primary gastro-enterostomy, to be followed at a later operation, if necessary, by gastrectomy.

(7) *Lesions of the small intestine and colon.* Excision, with anastomosis.

(8) *Lesions of the gall-bladder.* Cholecystectomy.

(9) *Lesions of the liver.* If cancer, generally secondary to cancer elsewhere. Exploratory excision rarely necessary or advisable.

(10) *Lesions of the rectum.* Excision of a portion of the growing edge of the lesion, with cauterization.

## EARLY AND DOUBTFUL CASES OF CANCER

- (11) *Lesions of the kidney.* Nephrectomy.
- (12) *Lesions of the bladder.* Cystoscopy, and excision of a portion of the lesion.
- (13) *Lesions of the prostate.* Prostatectomy.
- (14) *Lesions of the testicle.* Orchidectomy.
- (15) *Lesions of the cervix of the uterus.* (a) Excision of the lesion; (b) amputation of the cervix; (c) excision of a fragment of tissue, with cauterization.
- (16) *Lesions of the fundus of the uterus.* Curettage.
- (17) *Lesions of the ovary.* Oophorectomy.
- (18) *Lesions of the breast.* Local excision of tumors of the breast suspected of being malignant and submission of the tissue for subsequent pathological report cannot be recommended. If direct incision with frozen section diagnosis is not possible, amputation of the whole breast with dissection of the axilla should be performed in suspected cancer in women over thirty-five years of age.
- (19) *Lesions of the lymph-nodes in the neck, axilla, and groin.* A block dissection of the area involved, including the adjacent lymph nodes, is to be recommended in preference to the excision of a single suspected node.
- (20) *Sarcoma and obscure tumors deeply placed.* Exploratory removal of tissue for subsequent pathological examination cannot be recommended. Facilities for direct exploration and frozen section diagnosis should be secured, before radical operation, such as amputation, can be justified.
- (21) In general, superficial and ulcerated lesions may safely have fragments of tissue removed, especially if a cautery is used to seal the lymphatics, whereas in deep tumors, where the exploratory excision necessarily opens up normal tissue to infection, exploratory excision, unless followed immediately by operation at the same sitting, is to be condemned.

The writer would here express his thanks to the many members of these societies who have been to the pains to read and answer the numerous inquiries in this circular letter. The subject appeared to be one of such vital importance to the general policy of the campaign to obtain better treatment for cancer cases as to justify the attention and effort of those best suited to give expression to authoritative opinion. The response to the questionnaire has been most gratifying, and it is to announce and to discuss the opinions thus obtained that this communication has been prepared.

As was stated in the circular letter, the use of the immediate frozen section diagnosis of suspected tissue was not submitted for discussion. It is quite beyond the possibilities for such service to be rendered by any Cancer Commission or Public Health Laboratory. It must be provided, if at all, by the resources of the individual hospital or operator. In general, it may be said that the immediate frozen section diagnosis of suspected material offers, probably, the least dangerous method of obtaining light on the diagnosis of cancer tissue—that is, least dangerous to the patient as regards the artificial spread of the disease, but not, unfortunately, free from danger as regards the possibility of erroneous diagnosis. I have known the frozen section method to fail in such an instance as this: A breast suspected of being malignant is removed in toto; the pathologist present at the operation makes numerous sections of the tissue, and cuts frozen sections of the suspicious areas; no cancer is found; the operation (an incomplete one) is finished, without dissection of the axilla. After ten

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days the pathologist discovers, in the routine paraffine section, that there is an area of cancer which escaped observation in the frozen section. The method is thus at fault in that it appears to give an accuracy that does not in fact exist. Such an occurrence as above detailed is probably known to many of you. It is the weak link in the frozen section chain, and must not be disregarded in estimating the value of the procedure.

When we speak of free diagnosis of suspected cancer tissue, however, we are speaking of the service which may be rendered by one or more central laboratories, involving the removal of tissue, placing it in tissue preservatives, sending it to the laboratory, and waiting for a certain length of time, say seven days, for a positive report. Under these conditions we must make up our minds when and where, if at all, the removal of fragments of tissue suspected to be malignant can be justified and recommended. One of the most widely accepted principles in the surgery of malignant disease is that cutting into cancer tissue leads to a spread of the disease. The proofs of the truth of this assertion are so common in the experience of every practising surgeon that examples are scarcely needed, but I may say that in my own experience not one case of cancer of the breast has been saved in which a primary local operation has been done under the erroneous diagnosis of a benign tumor, even when followed at an interval of seven to ten days by the most complete operation, when the pathological examination of the original tumor disclosed malignancy. With regard to other situations it is probable that the danger is not so great, but it is difficult to draw the line, and eighteen Fellows of this Association in their replies stand squarely by the general proposition that exploratory incision into cancer tissue is *never* justified. In this connection, however, it must be said that we are looking at this matter from the point of view of preserving the patient's chance, such as it may be, for a successful operation for the radical cure of the disease. Where we are dealing with a case of presumably inoperable cancer the same conditions do not hold. It is not then a matter of preserving the patient's chance for radical cure; it is, rather, a question of saving him a serious operation which may quite possibly be of no benefit. Under these circumstances the removal of a single node above the clavicle, and the pathological report that it is malignant, may save a useless operation for cancer of the stomach, or for hypernephroma. In this same category belong, I believe, many of the exploratory incisions for tumors of the cervical lymph nodes, where the diagnosis rests between tuberculosis, Hodgkin's disease, and carcinoma or sarcoma. If carcinoma or sarcoma, radical operation is probably out of the question, and the removal of a single node does little, if it is malignant, to hasten the end, and may give information of tuberculosis or Hodgkin's disease which will lead to appropriate treatment and beneficial results. In cases of this class the objections to the exploratory incision are obviously less than when the possibility of radical operation is still to be considered.

Before stating the replies, as they have been received, to the specific questions in regard to cancer in different situations, it is interesting to note

## EARLY AND DOUBTFUL CASES OF CANCER

that consistency is just as rare a characteristic among medical men as it is among other human beings. We all have our principles, and we want to live up to them, but we rarely succeed in every instance. The exploratory incision into cancer tissue is, in fact, a confession of weakness—of the inability to make, from external signs and symptoms, a diagnosis of sufficient certainty to stand the crucial test of a mutilating operation. It is a curious and interesting fact that the individual surgeon advises the application of the exploratory incision chiefly in those cases with which he is least familiar, and where he finds it hardest to make an early but positive diagnosis. Most of us advise against exploratory incision in breast tumors, but think it sometimes permissible in cancer of the tongue. Many surgeons perform a total hysterectomy in preference to an exploratory excision of suspected cancer of the cervix, or in preference to a curettage for doubtful cancer of the fundus. When it comes to such mutilating operations as those for radical cure of cancer of the tongue, or jaw or larynx, however, we most of us want the support of a pathological report before the operation is undertaken in the doubtful cases; and yet the principle is the same, and the danger of the exploratory incision is probably just as great. It is in such cases as this that it is difficult to be consistent.

Replies were received from sixty-nine fellows of the American Surgical Association, forty-one members of the American Gynaecological Association and twenty-four members of the American Association for Cancer Research and the American Society for the Control of Cancer—a total of one hundred and thirty-four letters. Not all were willing to commit themselves to a detailed expression of opinion, but the views expressed were invariably of interest, and many points were suggested for more detailed discussion.

Seventy-two out of seventy-three replies favored removal of the whole of any small suspected nodule of the external skin. Exploratory excision of a fragment in large tumors of the skin was approved by fifty-eight, but twenty-six objected to it as a dangerous procedure.

The replies in regard to suspected lesions of the lip and tongue were practically the same. All agreed that if small the whole lesion should be removed; if large, nearly one-third (29-80) of the replies expressed disapproval of the proposed removal of a fragment and cauterization of the wound.

When it came to the suspected lesions of the palate, those who disapproved of the exploratory excision were fewer in number, but they were very emphatic that the procedure was a dangerous one (24-57). This is undoubtedly due, in part, at least, to the grave prognosis of cancer of the palate under any conditions, for in suspected cancer of the oesophagus those objecting to the exploratory excision of tissue were still less in number (13), and some of them objected not on account of the spread of the disease but because of the danger of perforation.

When it comes to suspected cancer of abdominal organs, like the stomach, intestine, gall bladder, etc., the total removal of the suspected organ or

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	Surgeons	Gynæcol- ogists	Pathol- ogists	Total
<b>1. External skin:</b>				
(a) Small—excision:				
Pro.....	59	11	2	72
Con.....	0	0	1	1
?.....	0	0	0	0
(b) Large—fragment:				
Pro.....	32	15	11	58
Con.....	25	0	1	26
?.....	0	0	0	0
<b>2. Lip:</b>				
(a) Small—whole:				
Pro.....	57	12	11	80
Con.....	1	0	1	2
?.....	0	0	0	0
(b) Large—fragment:				
Pro.....	29	7	10	46
Con.....	27	0	2	29
?.....	0	0	0	0
<b>3. Tongue:</b>				
(a) Small—whole:				
Pro.....	57	11	12	80
Con.....	0	0	0	0
?.....	1	0	0	1
(b) Large—fragment:				
Pro.....	29	11	9	49
Con.....	27	0	2	29
?.....	0	2	0	2
<b>4. Palate:</b>				
Fragment:				
Pro.....	38	9	10	57
Con.....	20	1	3	24
?.....	2	1	0	3
<b>5. Oesophagus:</b>				
Fragment:				
Pro.....	37	10	6	53
Con.....	9	1	3	13
?.....	10	4	0	14
<b>6. Stomach:</b>				
Whole:				
Pro.....	56	15	10	81
Con.....	0	0	0	0
?.....	1	2	0	3
<b>7. Intestine:</b>				
Whole:				
Pro.....	59	19	10	88
Con.....	0	0	0	0
?.....	0	1	0	1
<b>8. Gall-bladder:</b>				
Whole:				
Pro.....	58	16	11	85
Con.....	0	1	0	1
?.....	0	1	0	1
<b>9. Liver:</b>				
Pro.....	51	18	10	79
Con.....	7	2	0	9
?.....	0	0	0	0
<b>10. Rectum:</b>				
Fragment:				
Pro.....	37	16	10	63
Con.....	20	3	2	25
?.....	1	1	0	2
<b>11. Kidney:</b>				
Whole:				
Pro.....	56	20	9	85
Con.....	3	1	0	4
?.....	0	1	1	2

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	Surgeons	Gynaecologists	Pathologists	Total
<b>12. Bladder:</b>				
Fragment:				
Pro.....	39	18	8	65
Con.....	15	2	1	18
?.....	5	0	1	6
<b>13. Prostate:</b>				
Whole:				
Pro.....	52	11	6	69
Con.....	5	0	2	7
?.....	4	3	2	9
<b>14. Testes:</b>				
Whole:				
Pro.....	57	11	9	77
Con.....	2	0	0	2
?.....	0	3	1	4
<b>15. Uterus (cervix):</b>				
(a) Excision:				
Pro.....	25	9	5	39
Con.....	28	22	7	57
?.....	2	0	1	3
(b) Amputation:				
Pro.....	30	9	4	43
Con.....	22	21	7	50
?.....	0	0	1	1
(c) Fragment:				
Pro.....	26	17	9	52
Con.....	26	15	2	43
?.....	0	0	1	1
(d) Cautery excision.	...	...	...	5
<b>16. Uterus (fundus):</b>				
Curettage:				
Pro.....	36	28	9	72
Con.....	12	7	3	22
?.....	5	1	2	8
<b>17. Ovary:</b>				
Whole:				
Pro.....	26	31	12	69
Con.....	1	1	0	2
?.....	2	1	0	3
<b>18. Breast:</b>				
Whole:				
Pro.....	50	21	9	100
Con.....	6	3	1	10
?.....	3	2	1	6
<b>19. Lymph-nodes:</b>				
Whole:				
Pro.....	47	17	8	72
Con.....	7	4	3	14
?.....	3	2	1	6
<b>20. Sarcoma:</b>				
Whole:				
Pro.....	54	19	9	82
Con.....	2	0	1	3
?.....	1	1	0	2
<b>21. General:</b>				
Fragment or whole:				
Pro.....	44	21	11	76
Con.....	9	0	1	10
?.....	5	1	3	9
<b>Cautery:</b>				
Pro.....				24
Con.....				11
Number incomplete operations.....				17
Pro-biopsy in general.....				8

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tissue is advocated in practically every case. This is undoubtedly due to the fact that the operation for cancer differs but little from that for benign lesions in its severity, or in the disability resulting.

In suspected cancer of the rectum, sixty-four are in favor of the exploratory excision of tissue, and twenty-five are vigorously opposed to that procedure—a number of conscientious objectors large enough to make us pause to consider whether their position is not well taken. About the same proportion exists in regard to the exploratory excision of tissue with the cystoscope in suspected cancer of the bladder—sixty-five are in favor, and eighteen are opposed to the procedure.

In tumors of the testicle and of the prostate, as might be expected, the removal of the entire organ is the procedure preferred in the great majority of the replies.

When it comes to cancer of the cervix of the uterus, the weight of opinion in favor of one or another procedure is not so clearly evident. Thirty-nine are in favor, and forty-seven are against simple excision of the lesion for pathological examination; forty-three are in favor, and fifty are opposed to simple amputation of the cervix; and fifty-two are in favor, and forty-three are opposed to excision of a fragment of tissue with cauterization of the wound.

In suspected cancer of the body of the uterus, seventy-two favor diagnosis by curettage, and twenty-two are opposed to this procedure, presumably on the ground that it may lead to dissemination of the disease. Twenty-five replies state that in suspected cancer of the uterus, a total hysterectomy should be performed at once, without waiting for the microscopic confirmation of the diagnosis—seventeen of these are fellows of the American Surgical Association, and seven of the American Gynaecological Association. In general, the procedure in regard to cancer of the uterus may be said to be still a matter of discussion.

There is a general unanimity of opinion in favor of the total operation in preference to the exploratory operation in cancer of the ovary—sixty-nine to two, and of the breast one hundred to ten—and yet the differences of opinion here are very marked. One surgeon underlines the statement in paragraph 18: "Amputation of the whole breast with dissection of the axilla should be performed in suspected cancer in women over thirty-five years of age;" and queries whether *anything* could do more to discredit the practice of surgery than this advice; while others express their hearty approval of this procedure, and suggest reducing the age limit to thirty- or even twenty-five.

Seventy-two agree, and fourteen disagree with the recommendation against the removal of single suspected lymph nodes, and yet eighty-two agree, and only three disapprove of the advice to avoid exploration in deep sarcoma.

Finally, seventy-six agree and ten disagree with the general recommendation that the exploratory removal of tissue be restricted to superficial and ulcerated lesions (to be followed by cauterization), and that it be

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avoided in deeper tumors where the excision would open up normal tissues to invasion.

In regard to the use of the cautery to seal the lymphatics after exploratory incision, opinion is not unanimous. Eleven are opposed to its use, chiefly on the ground that the hyperæmia resulting causes increased rapidity of growth. Twenty-five express themselves as favoring the use of the cautery in one or another situation as a safeguard against the spread of the disease. It has been the personal belief of the writer that the immediate occlusion of the lymphatics far outweighed in advantage any possible hyperæmia and consequent possible increased rapidity of growth which might occur at a later date.

To sum the matter up it may be said that the opposition to the use of the exploratory incision for the removal of tissue suspected of malignancy is very real. Many surgeons believe it is never necessary or advisable; others, and they are the majority, believe that in certain situations it is permissible when all other resources of diagnosis (in which should be counted the benefits of consultation) have been exhausted, and even then only (1) when the tumor is a superficial one, or (2) when a frozen section can be obtained immediately and the operation completed under one anæsthesia. Under these conditions, and under these conditions only, can the exploratory incision of the tumor tissue be justified as a reasonable surgical procedure. If exploratory removal of tissue is to be discountenanced what becomes of the project of the free diagnosis of suspected cancer tissue? I believe it assumes an importance greater than ever, because it should be applied to all pathological tissues removed for the cure of disease. The function should be a state function, and the report should go to the patient or his friends, as well as to the surgeon. It should be the final means of checking up the end-results of the surgical diagnosis and treatment of malignant disease. Only by some such drastic measures as this can the incompetent surgeon be prevented from depriving the patient of his one and only hope of cure of cancer by an early radical operation.

As a result of the analysis of the replies received a modification of the "Procedure Recommended in the Diagnosis of Early and Suspected Cancer of Different Organs" can be made, as follows:

1. Suspected, but doubtful lesions of the *external skin*: If small, complete excision of the lesion should be performed. If large, excision of a portion of the growing edge of the lesion, followed by cauterization, is to be advised only after all other resources of clinical diagnosis, including consultation, have been employed, and then only when facilities for immediate frozen section diagnosis are available and the operation for cancer, if it prove necessary, can be completed under one anæsthesia.

2. Suspected, but doubtful lesions of the *lip*. If small, V excision, with a good margin, of the whole lesion, should be performed. If large, excision of a portion of the growing edge of the lesion, followed by cauterization, is to be advised only after all other resources of clinical diagnosis, including consultation, have been employed, and then only when facilities for im-

mediate frozen section diagnosis are available and the operation for cancer, if it prove necessary, can be completed under one anaesthesia.

3. Suspected, but doubtful lesions of the *tongue*. Excision of the whole lesion, if small, should be performed. If large, excision of a portion of the growing edge of the lesion, followed by cauterization, is to be advised only after all other resources of clinical diagnosis, including consultation, have been employed, and then only when facilities for immediate frozen section diagnosis are available and the operation for cancer, if it prove necessary, can be completed under one anaesthesia.

4. Suspected, but doubtful lesions of the *palate*, *tonsil* and the *buccal mucous membranes*.

If small, excision of the whole lesion should be performed. If large, excision of the margin of the lesion, followed by cauterization, is to be advised only after all other resources of clinical diagnosis, including consultation, have been employed, and then only when facilities for immediate frozen section diagnosis are available and the operation for cancer, if it prove necessary, can be completed under one anaesthesia.

5. Suspected, but doubtful lesions of the *œsophagus*. *Œsophagoscopy*, and excision of the margin of the lesion may be performed, but the danger of perforation of the œsophagus must be borne in mind.

6. Suspected, but doubtful lesions of the *stomach*, *Pylorectomy*, *gastrectomy*, or *primary gastro-enterostomy*, to be followed at a later operation, if necessary, by *gastrectomy*. Here the difference in the severity of the possible operations for benign and for malignant disease is not sufficient to make an exploratory incision into suspected cancer tissue a necessary or advisable preliminary to radical operation.

7. Suspected, but doubtful lesions of the *small intestine* and *colon*.

Excision, with *anastomosis*. Here the difference in the severity of the possible operations for benign and for malignant disease is not sufficient to make an exploratory incision into suspected cancer tissue a necessary or advisable procedure.

8. Suspected, but doubtful lesions of the *gall bladder*. *Cholecystectomy*. Here the difference in the severity of the possible operations for benign and for malignant disease is not sufficient to make an exploratory incision into suspected cancer tissue a necessary or advisable procedure.

9. Suspected, but doubtful lesions of the *liver*. If cancer, generally secondary to cancer elsewhere. Exploratory excision, or incision into liver tissue, is rarely necessary or advisable, except to confirm a diagnosis of hopeless malignancy, and thus avoid unnecessary radical operation.

10. Suspected, but doubtful lesions of the *rectum*. Excision of a portion of the growing edge of the lesion, with cauterization, is to be advised only after all other resources of clinical diagnosis, including consultation, have been employed, and then only when facilities for immediate frozen section diagnosis are available and the operation for cancer, if it prove necessary, can be completed under one anaesthesia.

## EARLY AND DOUBTFUL CASES OF CANCER

11. Suspected, but doubtful lesions of the *kidney*. Nephrectomy. Here the difference in the severity of the possible operations for benign and for malignant disease is not sufficient to make an exploratory incision into suspected cancer tissue a necessary or advisable procedure.

12. Suspected, but doubtful lesions of the *bladder*. Cystoscopy, and excision of a portion of the lesion, with cauterization, is to be advised only after all other resources of clinical diagnosis, including consultation, have been employed, and then only when facilities for immediate frozen section diagnosis are available and the operation for cancer, if it proves necessary, can be completed under one anaesthesia.

13. Suspected, but doubtful lesion of the *prostate*. Prostatectomy. Here the difference in the severity of the possible operations for benign and for malignant disease is not sufficient to make an exploratory incision into suspected cancer tissue a necessary or advisable procedure.

14. Suspected, but doubtful lesions of the *testicle*. Orchidectomy. Here the difference in the severity of the possible operations for benign and for malignant disease is not sufficient to make an exploratory incision into suspected cancer tissue a necessary or advisable procedure.

15. Suspected, but doubtful lesions of the *cervix of the uterus*. (a) Excision of the lesion; (b) amputation of the cervix; (c) excision of a fragment of tissue, with cauterization. Opinion is not conclusive. Some advise hysterectomy on suspicion of malignancy. This is undoubtedly radical, but preserves the patient her best chance of cure. Others prefer the exploratory excision of tissue, or amputation of the cervix, to be followed immediately by the complete operation if frozen section shows cancer.

16. Suspected, but doubtful lesions of the *fundus of the uterus*.

Curettage. Opinion divided. Some advise hysterectomy on suspicion of malignancy. Others advise curettage and immediate frozen section diagnosis.

17. Suspected, but doubtful lesions of the *ovary*. Oophorectomy. Here the difference in the severity of the possible operations for benign and for malignant disease is not sufficient to make an exploratory incision into suspected cancer tissue a necessary or advisable procedure.

18. Suspected, but doubtful lesions of the *breast*. Local excision of tumors of the breast suspected of being malignant and submission of the tissue for subsequent pathological report cannot be recommended. If direct incision with frozen section diagnosis is not possible, amputation of the whole breast, with dissection of the axilla, should be performed in suspected cancer in women over thirty-five years of age. This is endorsed by ninety per cent. of the replies.

19. Suspected, but doubtful lesions of the *lymph nodes in the neck, axilla, and groin*, in cases where radical operation is a possibility even if cancer is found to be present. A block dissection of the area involved, including the adjacent lymph nodes, is to be recommended in preference to the excision of a single suspected node. Where obviously a hopeless

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case of cancer is shown to be present, removal of a single node may prevent a useless operation, and is to be recommended.

20. *Sarcoma* and *obscure tumors* deeply placed. Exploratory removal of tissue for subsequent pathological examination cannot be recommended. Facilities for direct exploration and frozen section diagnosis should be secured in cases where doubt exists after X-ray studies and other clinical means of diagnosis are exhausted, before radical operation, such as amputation, is performed.

21. In general, *superficial* and *ulcerated lesions* are the only ones in which fragments of tissue may safely be removed for microscopic diagnosis. In deep tumors, where the exploratory incision necessarily opens up normal tissue to infection, exploratory excision of suspected tissue is to be condemned, and should be avoided. Where other resources of diagnosis have been exhausted, an exploratory excision, with an immediate frozen section diagnosis, and immediate performance of the radical operation if it prove necessary, is the least dangerous procedure for the patient. No suspected tissue should be excised for diagnosis, unless by a surgeon who is equipped to perform immediately the radical operation for the cure of cancer of the organ involved.

22. To these recommendations may be added the following: The routine pathological examination of all tumor tissues removed by operation, should be made compulsory. To this end competent laboratories for the free diagnosis of pathological material should be maintained as a function of the State.

## A TECHNIC FOR THE RADICAL CAUTERY OPERATION IN BREAST CANCER \*

BY JAMES FULTON PERCY, M.D.  
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FOLLOWING the progressive and improving work of Halsted, of Baltimore, Willy Meyer, of New York, and Kocher, of Berne, Switzerland, the results in the operative treatment of cancer of the breast made a distinct and gratifying advance. But little has been added to the technic of their operative work in this condition except in the way of improved cosmetic appearance of the post-operative scar and ease of operating by the incisions of Jabez N. Jackson, J. Collins Warren and Francis T. Stewart.

We are probably warranted in believing that in the hands of trained operators 50 per cent. of the women who submit to the modern radical breast operation will live over the five-year period, without a recurrence of their carcinoma, provided always that the patient is at all in the operable class. In the remaining 50 per cent. the greater number will have recurrences within the first year of the radical removal of the breast. The writer has seen a rather large number of these recurrences in the last three years. The location of the new invasion has been about equally divided between the site of the operation, including the skin, and the supraclavicular region. The latter space, in the cases seen, had not been invaded by the surgeon in his previous operative work. In recent years I have seen no operated cases where metastasis had developed either in the abdomen, thorax, or in the extremities.

A recent post-operative recurrence in breast carcinoma, which came under my observation, was Mrs. M., aged thirty-four. She was born in Greece; the mother of three children; two miscarriages. When she presented herself for examination, because of a recurrence following removal of a left mammary carcinoma, she was three and a half months pregnant. The history of this breast is interesting from the fact that when twelve years of age she had an abscess which was incised by her physician. There remained a small lump in the scar which never disappeared. One and a half years ago this lump began to enlarge and at times was painful. Last June (1916) it had attained the size of a hen's egg, and was removed by a surgeon in a distant city, by the usual radical operation, including the extirpation of both pectoral muscles. She remained with no evidence of a recurrence for three months, when she began to fail physically,

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\* Read before The Western Surgical Association, December 15, 1916.

became very anaemic, and lost 35 pounds in weight. Her haemoglobin at this time was 50 per cent. (Dare). One month after her operation she noticed a lump in the operative scar, size of an olive. There were also movable masses in the outer quadrant of the right breast, size of a hen's egg, that she had noticed for four years (Fig. 1). The axillary glands on this side were also involved, many of the size of marbles being present. The right side had not been operated, why I do not know. The supraclavicular glands on this side were not palpable. The patient was bedridden and a physical wreck. Her left arm was enlarged about one-third. Metastasis was marked both on the operated and unoperated side, extending along the subclavian and axillary vessels. On the operated side points of recurrence, both in and below the skin, were very numerous. These were especially noticeable in the scar of the former operation and especially in the auxiliary incisions, which had been made in order to relieve the tension in the stretched flap. There were also recurrences in practically every suture scar. The new growths along the axillary vessels were extensive, fixed, and extended nearly one-third the way down the arm. The supraclavicular glands were not palpable on this side. The skin in the axilla was adherent to the underlying structures and on manipulation gave the examining finger the impression of a bony growth surrounding the axillary vessels, at least three inches long and two inches wide. All the tissues in this region, including the skin, were firmly fixed and immovable (Fig. 2).

The patient complained of no pain in the thorax, no cough, and there was no special dyspnoea on exertion. The X-ray disclosed no metastasis in the lung tissue. This woman had a pale, pasty look, her eyes were sunken, the leg muscles were greatly atrophied, and with it all she was in the trough of despair. She had recently visited a number of clinics and from them all had received the usual advice: to go home, take morphine, and die.

From any point of view, to say nothing of its surgical aspects, this case was a most unpromising one. My purpose in reporting it, however, is not to describe the technical difficulties incident to the treatment of a case of this character by the cautery; but, rather, to emphasize, first of all, the ease with which the cold steel knife, in some cases at least, disseminates by auto-infection the cancer-cell, or germ, and, second, to describe a technic by the use of the cautery knife, which will reduce the danger of the dissemination of this unknown infection to a minimum. A careful view of Fig. 2 easily demonstrates the area of the skin surface and of the axilla involved in the recurrence following so soon after this patient's operation.

Modern surgery has always recognized the necessity of preventing bacterial infection of the operative field. In an indefinite, or, rather, perhaps, in a haphazard way, this necessity has been recognized also in the operative surgery of cancer. Autotransplantation infection in cancer



FIG. 1.—Movable masses in right breast.

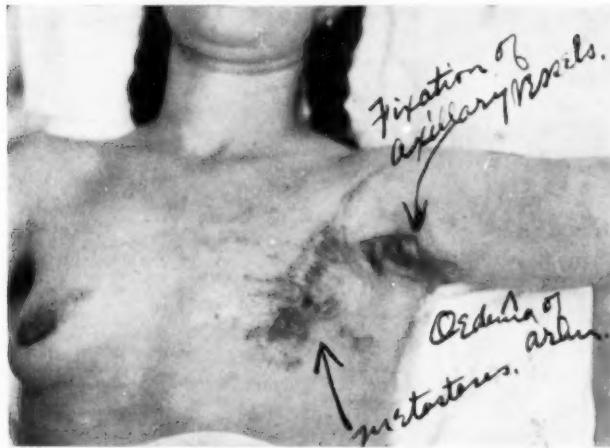


FIG. 2.



FIG. 3.—Note enlargement of arm and forearm, six weeks after cauterity removal of the breast. The wound is granulating and healthy.

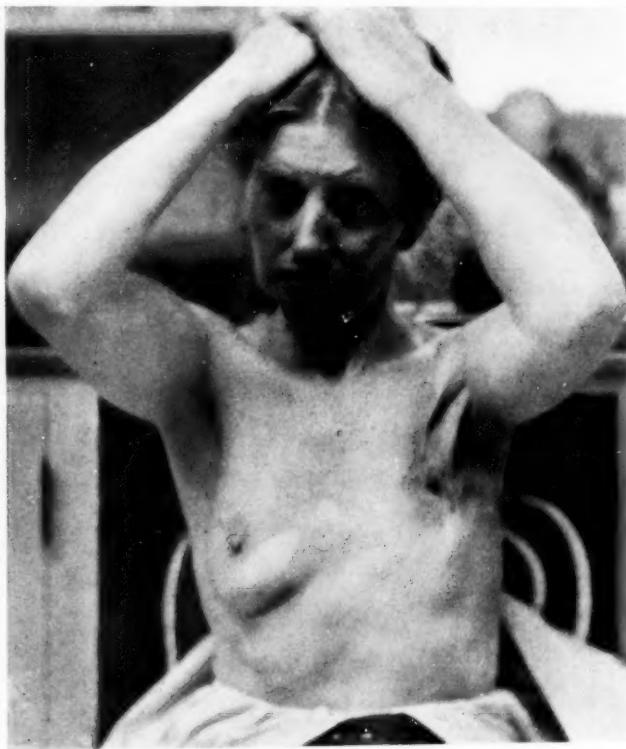


FIG. 4.—Showing condition of patient, one year after operation.



FIG. 5.—The application of small pieces of adhesive plaster, after the method of Beck. This technic limits secretion from the wound, encourages cicatrization, and adds to the comfort of the patient.



FIG. 6.—Note the wide grasp of the sutures. This insures a better repair of the cautery incision.



FIG. 7.—The outline of the clay-pipe incision to be made with the cautery on the iodine-covered skin.



FIG. 8.—The upper cautery shows the incorrect method of getting under the skin. The dimpling incident to pushing the cautery under the skin permits of too much destruction of the skin surface. The lower method, whereby the skin surface is lifted up by a wide-jawed tenaculum forceps, and the cautery pushed under the skin, in the line previously mapped out on the surface, gives a better result in the final healing, because of the irradiated heat.



FIG. 9.—Cautery dissection of the flaps.



FIG. 10.—Opening up of the axilla by severing the tendons of the pectoralis major and minor with the fingers placed back of the tendons. The cautery is shown too near the cut edge of the skin.



FIG. 11.—It is better to hold the gland-bearing fascia with the fingers in place of the dissecting forceps and keep them nearer the cautery knife than is shown in the illustration. This will enable the operator to gauge the degree of heat that is being spilled over the vessels and tissues.



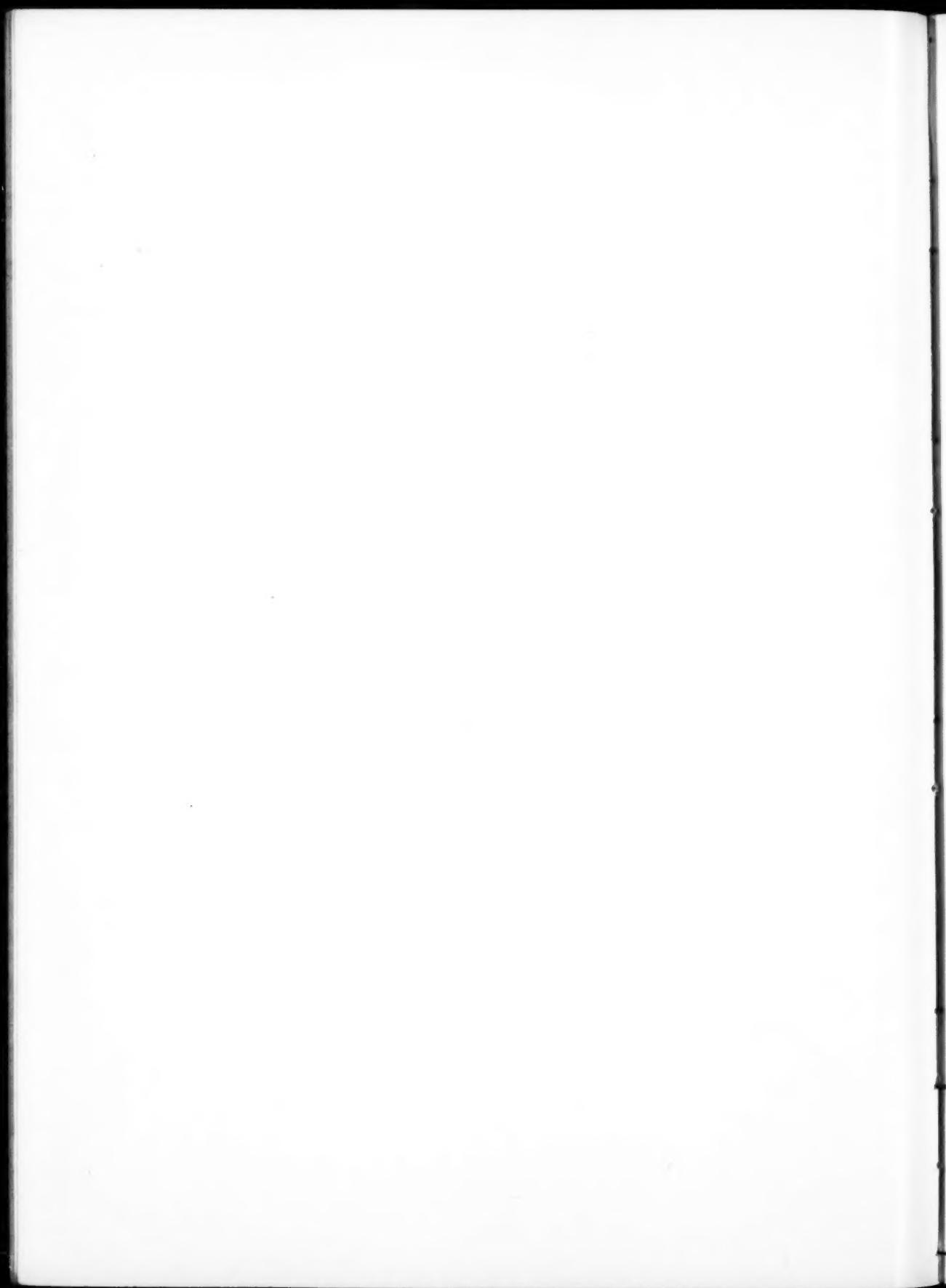
FIG. 12.—Removal of the gland-bearing fascia with the cautery. The fascia should be held with the fingers, as stated under Fig. 11, and close to the cautery. This is especially true when cleaning off the axillary vessels.



FIG. 13.—The condition of the patient and the character of the wound fifteen days after the operation are well shown.



FIG. 14.—Appearance of the wound forty-nine days after the cautery dissection. The axillary vessels are well covered in by healthy granulations, and this is true of the whole wound area. This patient died suddenly the day following the date of this photograph. There was extensive metastasis into the left hip and throughout the whole bony structure of the pelvis. The operated breast area was free from cancer.



## CAUTERY OPERATION IN BREAST CANCER

is an insistent fact when the ordinary methods for its removal are used, and the only means at our command for its prevention have been mainly by the advocacy of incisions made wide of the disease; this, always, with the hope not only of getting all of it, but, more to the point, of preventing the knife of the surgeon from coming in contact with a small focus of the disease at an unusually outlying point. The trouble is that the disseminating and stimulating effects of the cold, sharp edge of the surgeon's scalpel have not been recognized acutely enough. This danger, I repeat, has always been known when infective bacteria was the problem in the operative field. But infective bacteria, when managed according to present day surgical principles, are a simple enigma in comparison to the cancer-cell. Surgery, so far, has not been able to evolve any principle, or principles, that either modifies or prevents the slow but certain progressive development in the tissues of the cancer-cell, except the one just mentioned, of wide excision. Bacterial infections are usually surface infections. They can be washed and poisoned away. The infections of cancer are not surface infections. They cannot be washed or antisepticized, because they are in the tissues and skin, not outside of them. Modern surgery has not yet recognized this fundamental difference in a practical way. Present day surgery still exposes and spreads cancer along newly-made tissue surfaces, and stimulates it into new virulence with the cold steel knife, and then carefully sews in and covers up with flaps the infection of cancer where it can spring again into new life, uncontrolled and unhindered. In this way we ignore every known surgical principle for the prevention of cancer infection. When the flaps are sewed together, we have a hope that nothing is left in them, or in the wound, and we keep on hoping for five years that the infection will not show up.

The prevention of the auto-dissemination of cancer during its removal is the greatest problem in the operative treatment of the disease to-day. This is especially true in the so-called inoperable types of advanced carcinoma, regardless of its location. In offering the cautery knife as a valuable substitute for the cold steel knife, I do so because it disseminates heat and heat kills the infecting principle, whatever it may be, of cancer. The cautery will destroy the infecting agent, not only with every step of the dissection at the immediate point of contact, but a considerable distance beyond. This is true of the cut edges of the tissues, of the flaps, and of the deeper structures, as well. They are left not only sterile, but immune to the further development of the cancer growth. It should also be emphasized that all tissues involved in cancer should be manipulated in the most gentle way possible, both before and during operative procedures. I am convinced that to ignore this means a greatly increased possibility of disseminating the disease into new regions.

It will probably be of interest and value to state here that I have seen no untoward results from the use of the heat, even when large areas of the thorax, axilla and the neck were denuded of their coverings by the heat technic that I shall outline below.

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The only possible exception to this is Mrs. F. M., aged forty-two, who was suffering from a very extensive infected and ulcerating right mammary cancer which she recognized first some four years previously. The right arm was also greatly enlarged, painful, and useless. Her chief complaint, however, was from what she called her "rheumatism." This seemed to consist of a generalized myositis. The pain, together with the stench from the ulcerating breast, was what finally drove her to seek surgical relief. The involvement of the axilla, with the extension of the malignancy from the breast, was so great that I decided to do an interscapulothoracic amputation at the shoulder-joint, with the cautery, at the same time that the breast was removed. The operation was performed December 22, 1914, and required thirty minutes. No clamp was used at any time, except on the subclavian artery and vein. This woman was a bad risk from the beginning, but she was out of bed and in a wheel chair on the third day, and was having a normal convalescence until the eleventh day, when she developed a chill, rusty sputum, and a pneumonia in the left lung (the one opposite the operative field) and died on the third day, fourteen days following her operation. This result may have been connected in some way with the extensive use of the cautery, but I have never been convinced that it was. This is my only operative fatality.

My only accident from the use of the cautery in the axilla occurred while operating on Mrs. J. P. H., aged fifty-eight, who was first examined March 25, 1916. Three years before she had noticed a small lump in the outer edge of the left breast. She had had no previous treatment and consulted the surgeon only because the breast was ulcerating and painful. At the time of the examination, the breast was fixed to the thorax, and showed both glistening red and blue areas, as well as the ulcer, which was about the size of a silver dollar. The X-ray disclosed no involvement of the lung or ribs. Amputation of the breast and dissection of the axilla with the cautery was done March 26, 1916. In dissecting the axilla the cautery knife was carelessly allowed to touch the axillary vein for too long a time, and instantly the whole of the exposed vein became thrombosed, as is shown in Fig. 3. The arm increased in size, at least one-third, before she left the hospital. In physical appearance it reminded one of the familiar lymphangitis that occasionally follows breast amputations by the ordinary technic. Fig. 4 shows the present condition of this patient, and especially of her arm. The enlargement practically disappeared in six months. The function of the arm, at the present writing, is in no way interfered with, except by the scar, which resulted from the extensive dissection required at the primary operation. The return of the circulation in the arm can probably be explained by the ease with which the collateral circulation is re-established through the cephalic vein over the top of the shoulder.<sup>1</sup>

<sup>1</sup>This patient recently presented herself because of severe pain in the left humerus. An X-ray showed a metastatic focus, involving the whole diameter of the humerus at its middle portion, about one and one-half inches in length. The arm was then amputated with the cautery at the shoulder. At the present writing she is in good condition.

## CAUTERY OPERATION IN BREAST CANCER

The actual technic of the use of the cautery is essentially not unlike the ordinary method with the steel knife. When one becomes familiar with this, the danger is no greater, as far as the axillary dissection is concerned, than with the scalpel. More than this, there is a great satisfaction in knowing that the hot knife is not disseminating carcinoma in its way through the tissues, and, besides, the heat is having an influence for good considerably beyond the area involved in the immediate contact with the cautery knife. In other words, the heat can be made to go safely where the cautery or cold steel knife cannot go. The explanation is that the circulating blood remains at a constant temperature, indeed, acts as a water-cooled speculum, thus protecting the walls of the larger blood-vessels, but not the carcinoma which may be in the tissues about them.

Frequently, intact carcinoma cells can be found about a large blood-vessel. In such cases, it is probable that the circulating blood prevented the heat from attaining a temperature sufficiently high to destroy the attached carcinoma cells. The blood-vessel has merely acted as a water-cooled speculum, protecting the carcinoma cells from the destructive action of the heat. No artery clamps should be used to arrest hemorrhage in the small vessels, the application of the heat is sufficient. This not only arrests the hemorrhage, but it does more by destroying the possibly present nesting carcinoma cells. It is for this reason also that in these advanced cases, flaps to cover the wound should not be especially striven for. If small points of carcinoma develop in the uncovered wound, they can be treated at any subsequent dressing by applying a little cocaine and touching them with the cautery point until destroyed.

Again, scar tissue of this type seems more likely to remain free from a new growth of malignancy than is the normal tissue. This surface treatment of cancer by heat is thus made much more effective than can ever be true of cavity carcinoma. Carcinoma developing under the made flaps, following a breast amputation, puts it at once in the same class with the insidious type of cavity carcinoma, *i.e.*, the small points of recurrence cannot be recognized early enough for the most effective treatment when covered by the flaps.

Wiping out the axilla with gauze is, I am convinced, a fruitful source of recurrences in removal of the carcinomatous breast. This method of dissection also violates every surgical rule for the prevention and dissemination of infection and should be included with the cold steel knife in its dangerous proclivity to stimulate anew the growth of cancer.

Freedom from hemorrhage is one of the very important advantages of using the cautery knife. It not only shortens the time that would otherwise be taken in clamping and tying bleeding vessels, but, as stated above, it lessens the possibility of a recurrence about the blood-vessels. More than this, the work of Gaylord seems to show that the saving of blood

is an important factor in lessening the destruction of the natural immunity that most of these cases undoubtedly possess.

Necrosis of the exposed ribs frequently follows the application of the heat. But I have never seen this necrosis go below the edges of the intercostal muscles, and I have yet to see either a pleurisy or a pneumonia develop, except in the one case mentioned above. Indeed, the majority of these patients are remarkably free from pain, or any other form of uncomfortable post-operative experiences. Cooked flesh tells no tales.

The post-operative treatment is dependent upon whether flaps are used, or not. In the very advanced cases in which no attempt is made to obtain flaps, the surface is immediately covered with adhesive plaster, after the method of Beck (Fig. 5). Where flaps are used to cover the wound, all or in part, they can be undermined or dissected up by the cautery in exactly the same way that is done where the steel knife is used. Sloughing of the flaps is rare, except occasionally at the points. In a few cases (two) where the tension on these flaps has been more than moderate, an active inflammatory condition developed that almost suggested an erysipelas. Both of these were in very fat women. Relieving the tension by removing some of the sutures, and the application of a solution of boracic acid and alcohol improved the condition, usually within twenty-four hours. It is very probable that some of the newer antiseptic solutions that have come into use as a result of the European War would find a useful place in cleaning up these uncovered cautery breast wounds.<sup>2</sup> Where the flaps are employed, usually one drainage opening is sufficient. In closing the wound, it is important to put the sutures about three-fourths of an inch back in sound tissue and away from the coagulated edges of the wound (Fig. 6). This insures the sutures holding. If one wants flaps, they can be obtained nearer the gross mass of cancer than would be wise with the knife, for the reason that the heat almost insures against the further development of the cancer-cell in the flaps. The temperature of the knife should not be so great as to encourage very rapid cutting. To do this prevents the abnormal tissue cells from coming in contact with or being destructively influenced by the coagulating degrees of temperature which experience has shown are most useful for this purpose.

The four factors most useful in the heat technic are: First, mark out on the iodine-covered skin, with the cautery knife, the limits of the incision to be made (Fig. 7). Second, do not cut with the cautery knife from above downward into the skin in following this line, but from within outward. This can best be done by lifting the skin up with a tenaculum forceps (Fig. 8) and pushing the hot knife into and under the skin, and cutting from within outward. To do otherwise causes too great a

<sup>2</sup> Since writing the above, I have found that one of the most valuable of these solutions is "eusol." It consists of twelve and one-half Gm. each of acid boracic and chlorinated lime in one litre of water. Shake. Let it stand for three hours and filter.

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sloughing of the edges of the skin. The drainage hole should also be made by pushing the cautery knife through the skin from within outward. Third, and very important, in dissecting about the axillary vessels and brachial plexus, hold the tissues that are to be removed with the fingers of the free hand encased in a medium-weight rubber glove, and keep the fingers close to the cautery knife (Fig. 9). This is the most practical way of gauging the degree of temperature that the tissues and blood-vessels will stand, without being injured. If the axillary vein or artery is not actually touched for too long a time with the hot knife, they will remain uninjured. Fourth, apply the heat until all the tissues that were fixed by the disease are freely movable. To do otherwise simply means that heat dissemination in the most effective way has not been obtained.

The two most important factors in the after-treatment are: First, to keep the wound clean, which can easily be done by alternating the use of adhesive-plaster covering with the "eusol" solution, and exposure to the direct rays of the sun; and, second, to keep the arm in a vertical position alongside of the head. This prevents both oedema and cicatricial contraction.

## ✓ REGIONAL ANÆSTHESIA IN EXTRAPLEURAL THORACOPLASTY AND SOME INTRATHORACIC OPERATIONS\*

BY WILLY MEYER, M.D.

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WHOEVER has followed the trend of events as regards the production of analgesia must have been impressed by the fact that abroad the tendency of surgeons has been to become emancipated from general anaesthesia in their daily work, as much as possible, whereas the majority of American surgeons have faithfully worked for years to improve and safeguard general anaesthesia.

Only a few surgeons here have employed regional anaesthesia on a larger scale within the last years. That it must be an advantage to the patient not to have taken an anaesthetic needs no discussion. Whenever the main nerve-trunks that feed the operative field can be reached with safety, regional anaesthesia is feasible. All that is necessary on the part of the surgeon is practical experience and some patience as well as the time to wait until the fluid that produces the analgesia has taken effect.

It is important to remember that it is not a matter of necessity to have the needle strike the nerve-trunk itself, although this is naturally most effective and, usually, harmless, but that the "perineural infiltration," that is to say, the injection of the analgesic fluid into the tissues surrounding the nerve, suffices to block it. We know that sixty to seventy per cent. of all operations can now-a-days be carried out under regional and local anaesthesia. On my division at the German Hospital it has been practised for many years.

The surgeon's principal reason for not using this splendid method more often is lack of time. One *has to wait* until the injected fluid has taken effect, and it takes ten to twenty minutes. It is absolutely necessary to wait this long in major operations in which the work involves a larger area. In the more localized operations, such as, for instance, thyroidectomy, suprapubic cystotomy, etc., a few minutes are sufficient to produce the desired effect. If the surgeon has to, or wants to, carry out the injection of the analgesic fluid himself, he will do well to first attend to the infiltration, after disinfection of that portion of the skin where the injection has to be made, and then get himself and the patient ready for the operation. In our general hospitals it would seem to be in the interest of the work to have one man, *e.g.*, one of the assistant adjuncts, become expert in regional anaesthesia and then have him permanently assist in all these operations. He should "start the next case," same as we now are wont to have the anesthetist start the next general anaesthesia.

There certainly is no region of the body more favorable for the appli-

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\* Read before the American Surgical Association, June 1, 1917.

## REGIONAL ANÆSTHESIA IN EXTRAPLEURAL THORACOPLASTY

cation of regional anæsthesia than the thoracic portion and particularly the *chest-wall*, for there are the twelve pairs of thoracic nerves which feed it and can be reached with comparative ease and safety. But also some intrathoracic operations can be well done without general anæsthesia. Only the virgin-pleura, when divided on opening the pleural cavity, usually answers with such tremendous reflexes that a few whiffs of an anæsthetic become necessary at this time. Later on a drop of an anæsthetic, administered now and then, suffices to enable the surgeon to do his work. An inflamed and thickened pleura stands handling very well under regional anæsthesia.

An anæsthetist certainly must be at the helm. Many patients are extremely nervous and irritable. Some will simply refuse the operation unless they "can be put to sleep." In such cases we have conducted a sham inhalation anæsthesia with a solution of one-half alcohol and one-half water, or exceptionally, have had a few drops of chloroform or anesthol administered, not enough to cause the patient to completely lose consciousness.

Regarding my own experience with regional anæsthesia in thoracic surgery I have used it in cases of empyema and of lung abscess, in ligation of branches of the pulmonary artery, and particularly in extrapleural thoracoplasty. The latter term has been given to the operation of multiple rib resection, done in cases demanding compression of the affected side of the chest. The troubles that come into consideration in this respect are chronic suppurative inflammation of one or more lobes of the lung, of tuberculous or non-tuberculous character. As to the latter class, patients suffering from bronchiectasis have been subjected to the operation, mainly after branches of the pulmonary artery had been tied at a previous sitting for the purpose of producing shrinkage and carnification of the lung parenchyma by connective-tissue proliferation, after the lung had been thus deprived of its physiologic function (Sauerbruch-Bruns). In some instances I have also tried the effect of the operation without this preliminary procedure. In tuberculous patients the indication for extrapleural thoracoplasty has been established in the presence of cavity formation within the upper lobe, if compression by means of air- or nitrogen-insufflation into the pleural cavity had become impossible on account of adhesions that had formed between pulmonary and costal pleura, and hygienic medical régime had ceased to be of benefit.

As far as extrapleural thoracoplasty in bronchiectatics is concerned—to which class of patients my own experience with the operation so far has been confined—I hardly believe that it will be often resorted to now-a-days. The evolution of the surgery of this chapter certainly points in this direction. Experience so far gathered has shown that, even with the preliminary ligation of the feeding branch of the pulmonary artery, the operation will but improve the disease—rarely cure it. Earlier cases of bronchiectasis in which all the lobes of one lung are affected seem to yield to methodical irrigation of the bronchial system of the affected lung with antiseptic fluids. When confined to one lobe alone pneumotomy with prolonged drainage will sometimes bring the desired result; a persistent bronchial fistula can be

closed by a secondary operation later. In more advanced cases the excision of the affected lobe will have to be done in one or more stages. A number of surgeons, particularly in this country, are now hard at work trying to find ways and means of lessening the dangers of this operation. Hence, typical extrapleural thoracoplasty will at present come into consideration principally in cases of advanced pulmonary tuberculosis that are beyond help from the milder procedures and would be left to die if the bloody operation were not resorted to.

For the sake of completeness I will mention that we have three methods of extrapleural thoracoplasty, that of Friedrich, Sauerbruch and Wilms.

Friedrich, at the suggestion of Brauer—both then holding positions at the University of Marburg—raised the scapula with the help of the typical Schede incision (Fig. 1), with the patient under a *very* superficial chloroform anaesthesia. The tenth rib up to the second, or also including the first, were then resected subperiostally in their entire length. On account of its magnitude and frequent deleterious effect upon the heart's action in these weak and reduced patients, this method was soon abandoned. Sauerbruch then proposed the *stage-operation*. He insists that it is of importance in weak patients with reduced power of expectoration, first to compress the lower lobe with the help of thoracoplasty, in order to avoid aspiration-pneumonia of this lobe from the cavity formation within the upper lobe. For this purpose he resects the fifth to the tenth, or the sixth to the tenth ribs inclusive, at the first stage. At the second stage, following in about two weeks, the upper four or five ribs with or without a portion of the clavicle are cut out. Only if the patient seems to have considerable power of resistance the greater part of the first to the tenth rib may be removed at once. He uses the so-called posterior hook incision, a cut that represents the posterior half of the Schede incision (Figs. 2 and 3). In all his operations he employs regional and local novocaine anaesthesia.

Wilms does not attach any particular importance to the primary compression of the lower lobe, but attacks at once the upper ribs. He also prefers to operate in stages and favors the so-called "columnar resection," posteriorly as well as anteriorly, leaving the middle portion of the ribs in place (Fig. 4, B, C, D). In advanced cases of upper lobe cavity-formation the sternal portion of the clavicle is included in the resection in order to increase the compression (Fig. 4, A). Wilms also works with regional and local anaesthesia.

It stands to reason that it must be of great advantage to these patients if the operation can be carried out under regional anaesthesia. They thus remain able to expectorate at will, and have their mouths free and unincumbered. The ever-threatening aspiration pneumonia is thereby reduced to a minimum.

*Sensory Innervation of the Thoracic Wall.*—The sensation of the thoracic wall on either side is controlled by the twelve thoracic nerves. The first of these leave the intervertebral foramen between the first and second dorsal vertebræ, the twelfth between the twelfth dorsal and the first lumbar vertebræ.

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Immediately after they have made their exit from the spinal column, they divide into a stronger anterior and a weaker posterior branch (Fig. 5). Both are mixed nerves, viz.; they carry motor and sensory bundles. The anterior branch communicates with the sympathetic ganglion (Fig. 6), enters into anastomosis with its neighbors (ansæ or plexus), and innervates the broad muscles of the back. The posterior branch also anastomoses with its neighbors and innervates the long dorsal muscles and the skin of the back.

The anterior branches run in the intercostal space as "intercostal nerves." Each of these gives off to the chest wall a *nervus cutaneus lateralis*, which subdivide again into anterior and posterior branches ("nervi cutanei laterales pectoris anteriores et posteriores"). Of the *upper* six thoracic nerves the anterior branches of these lateral nerves innervate the skin of the mammary gland and the gland itself; the posterior branches provide sensation to the skin of the back. Of the *inferior* six lateral cutaneous nerves the anterior branches run to the skin of the anterior abdominal wall, the posterior branches to the skin of the back ("nervi cutanei laterales abdominis anteriores et posteriores"). The intercostal nerves, after having given off the lateral cutaneous branches of the chest, feed the intercostal muscles. At the border of the sternum they perforate the major pectoral muscle and terminate as "nervi cutanei anteriores" in the skin of the anterior aspect of the breast.

*Instruments.*—A syringe to which the needle can be firmly attached by a bayonet-arrangement (Fig. 7, *a*), or by a special design (bit-clutch) (Fig. 7, *b*), is preferable to the well-known record syringe. The latter lacks the firm unison with the needle; besides, it works hard and affords no support to the surgeon's second and middle fingers during injection of the fluid. The needle must be fine and of sufficient length (6 inches).

*Solution.*—A one-half per cent. solution of novocaine with suprarenin is usually efficient. A strength exceeding one per cent. is inadvisable. One hundred to two hundred cubic centimetres (about 3 to 7 ounces) may be required. If sufficient time is allowed to elapse between injection and start of operation (about 15 to 20 minutes), the analgesia will in most instances be satisfactory. If the patient reacts, a very few drops of an anæsthetic will quiet him. The hypodermic injection of morphine, or pantopon (one-half grain), one hour before the beginning of the operation, is of great assistance.

Whether the additional hypodermic administration of scopolamine is advisable I am not prepared to state as yet. We have seen most satisfactory results from this combination in all kinds of major operations. Perhaps it will prove equally beneficial in thoracic cases. The reason that I have not tried it has been that I feared it might not leave the patient sufficient self-control to cough and expectorate. If it were determined that this fear was unfounded, a hypodermic of scopolamine might be added with advantage also in these cases.

*Technic.*—There are two good methods at our disposal. One was worked

out at the Zurich Clinic (Sauerbruch), and published by the late Schumacher; the other is practised at the Kiel Clinic (Anschaetz), and was published by Kappis. Both appeared in print at the same time (*Centralbl. f. Chir.*, 1912, No. 8, pp. 249 and 252).

In the first method the nerve is reached at the angle of the rib (Fig. 8, *a*), in the second it is reached proximally to this location, viz: anteriorly and inwardly from the angle (Fig. 8, *b*). Here the thoracic nerve with all its branches can be infiltrated. The technic of the Kiel procedure is more difficult. In carrying it out the needle must strike the rib at or near its articulation with the transverse process of the vertebra. The location of this articulation is usually found  $3\frac{1}{2}$  cm. ( $1\frac{3}{8}$  inches) to the left or right of the median line. The difficulty is, that, because of the rib running forward and inward at this place, one cannot palpate its proximal extremity through the bellies of the thick muscles near the spine. However, even in stout individuals one of the lower ribs usually can be made out somewhere in the back. If the lower border of this rib is projected in the direction of the same medially, the point of entrance for the needle is found at the spot where this projection line crosses a perpendicular line drawn parallel to and  $3\frac{1}{2}$  cm. to one side of the median line, viz.: the spinous processes (Fig. 9). The next lower border of a rib above or below is about 3 cm. ( $1\frac{3}{16}$  inches) distant. In order to facilitate the work of finding the respective point of entrance at the subsequent ribs I had a flexible (sterilizable) tape-like metal-strip made, with a 3 cm. scale on one side and a  $2\frac{1}{2}$  cm. scale on the other (Fig. 9, *A*). This has been found a useful addition to our instrumentarium.

After the respective number of the palpable lower rib in the back has been ascertained all one has to do is to count the markings on the scale upward and find the top rib that is wanted. From here the operator will then proceed downward with the infiltration from rib to rib, as many as have been slated for resection. Or, if the lower rib, the number of which has been made out, lies within the operating field, one can commence infiltrating the thoracic nerve of this rib and then advance upward, step by step, at  $2\frac{1}{2}$  to 3 cm. distance. It seems best to commence with the lower rib and work from below upward.

Of course, this distance of 3 or  $2\frac{1}{2}$  cm. is not found correct in every instance. It varies with the size of the patient. Still, as an average, the marked distances have been a welcome aid. In order to be on the safe side, the thoracic nerve of the two ribs beyond the field of thoracoplasty, above as well as below, are included in the blocking.

For both methods the patient lies on the operating table, best on his stomach, with his head close to the upper end, and both arms hanging down perpendicularly (Fig. 10). A sand-bag or other round pillow supports the abdomen to overcome the lordosis. After proper disinfection and iodinization of the entire back, regional anæsthesia is started.

If the Zurich procedure is chosen, the line of the paravertebral skin incision (Fig. 2) is anæsthetized first and *within this line* the needle is painlessly introduced. The latter is advanced from below and inward in an



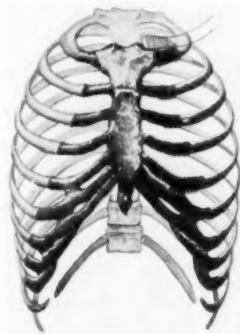
FIG. 1.—Schede's incision, raising a skin muscle flap including scapula, exposing the entire length of the first to tenth ribs.



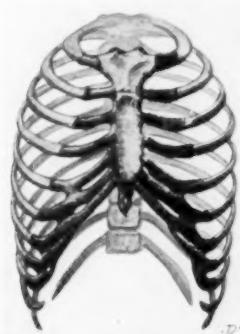
FIG. 2.—Sauerbruch's "hook incision," representing the posterior half of Schede's incision.



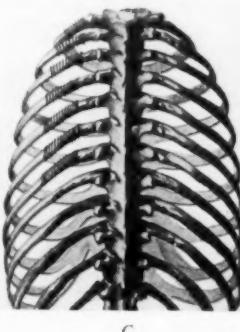
FIG. 3.—Exposure of the posterior two-thirds of the ribs by means of the "hook incision," the inner border of the scapula being pulled outwardly.



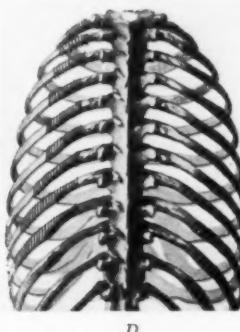
A



B



C



D

FIG. 4.—Illustrating Wilm's "columnar resection" of the ribs. (From *Muench. med. Wochenschr.*, 1913, pp. 450 and 451.) A, resection of the cartilages plus adjacent portions of the upper five ribs, also of the sternal extremity of the clavicle, in order to increase the contemplated compression of the diseased lung. B, same as in A, without the additional operation on the clavicle. C, resection of the upper seven ribs in the region of their angle. D, same as in C, operation involving the nine upper ribs. Note the increasing length of the resected portion of seventh to ninth ribs.

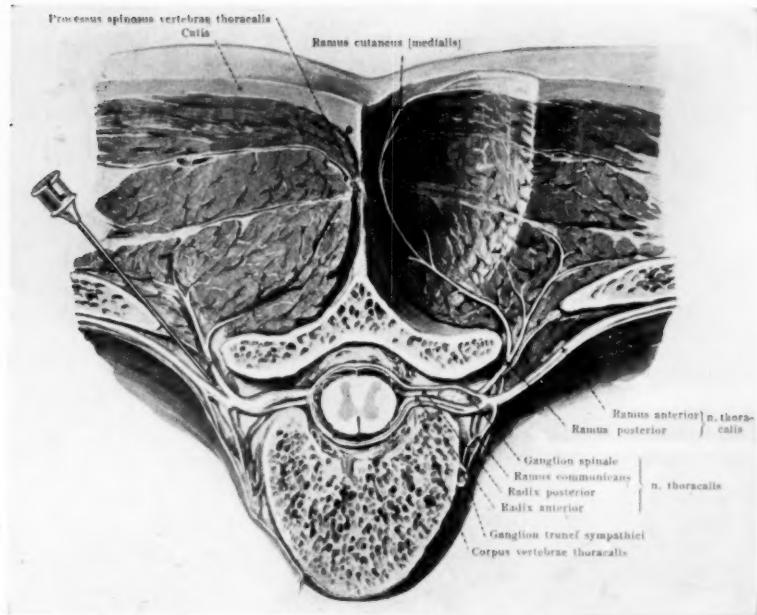


FIG. 5.—Transverse cut through dorsal spine with muscles of back. The needle has been added by author in order to point to the efficiency of this regional anesthesia if the method is carried out correctly. (From Spalteholz, "Handatlas der Anatomie des Menschen," vol. iii, Fig. 690.)

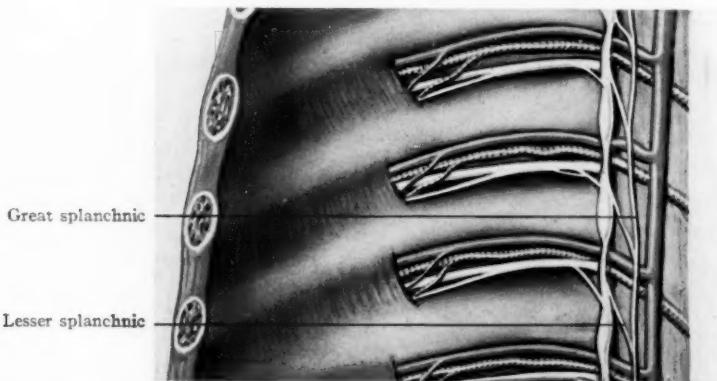


FIG. 6.—Showing anastomosis between the intercostal nerves and the thoracic portion of the sympathetic and its ganglia. (From Heitzmann, "Handatlas.")

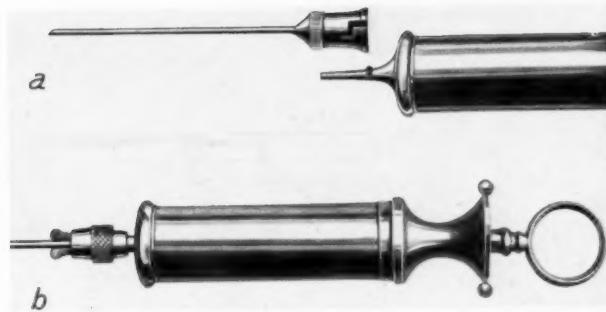


FIG. 7.—*a*, record syringe with a metal knob at nozzle. The needle shows the notch of bayonet attachment, making both parts a firm unit. *b*, Heynemann's all-metal syringe for local and regional anesthesia, holding needle with bit-clutch arrangement.

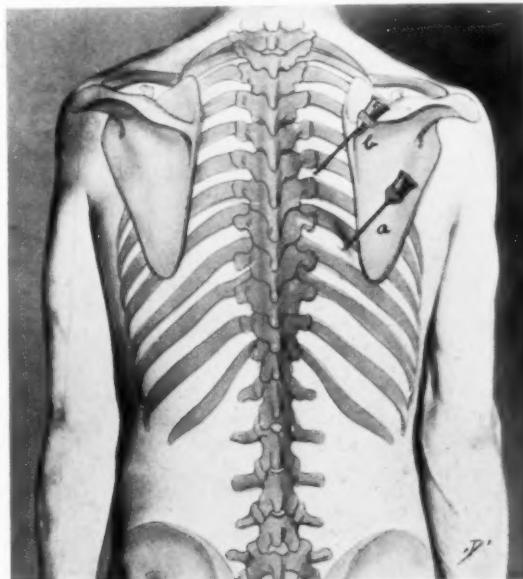


FIG. 8.—Diagrammatic, illustrating the location where the needle is introduced in Schumacher's, *a*, and Kappis's, *b*, methods. In practice the needle at *a* has to point upward and outward and run close to the rib.

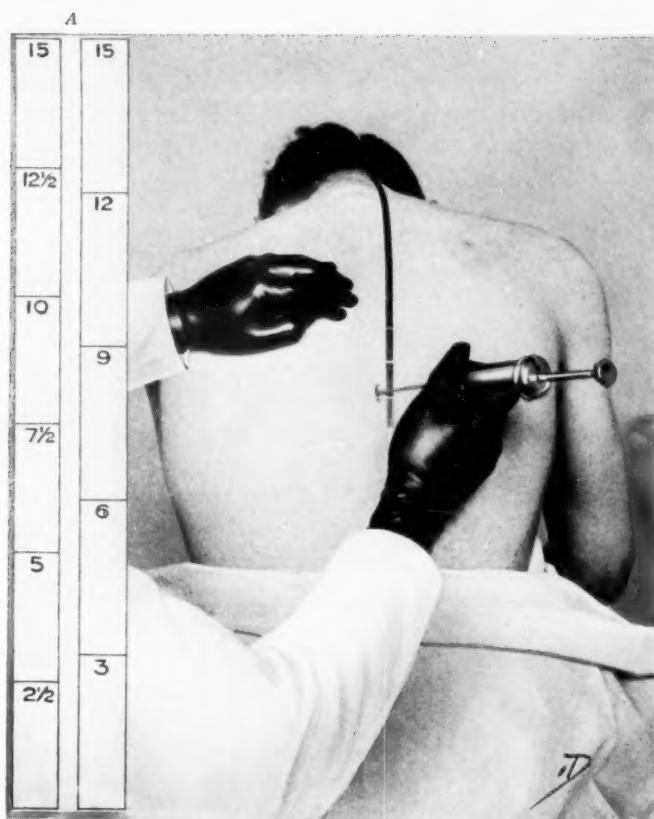


FIG. 9.—Illustrates Kappis's method of regional anaesthesia in thoracic operations, with the patient in the sitting posture. *A*, the sterilizable metal tape divided by  $2\frac{1}{2}$  and 3 cm.



FIG. 10.—The same as Fig. 9 with the patient in the abdominal posture, lying horizontally on the operating table. (In the picture the table has been tilted in order to allow the artist to photograph the entrance of the needle in the back.)

## REGIONAL ANÆSTHESIA IN EXTRAPLEURAL THORACOPLASTY

upward and outward direction toward the angle of the rib above. When the grating sensation is felt one to two c.c. of the fluid are deposited. The needle tip then finds the lower border of the rib, where 5 to 8 c.c. are injected. About 10 c.c. in all are used. The same procedure is then repeated with each successive rib.

If the Kiel method is used one of the lower ribs is carefully palpated and now the first point of entrance located as just described. The point of puncture is first frozen with the ethyl-chloride spray. The operator's nail marks the place for freezing the skin. As soon as the spot has turned white the needle is pushed through the skin and conducted slowly down in a straight sagittal line until it touches the bone. In the average case the distance from the skin to the rib measures about 4 to 5 cm. (1½ to 2 inches). The scratch of the needle's tip on the bone must be clearly felt. Now the operator searches with the needle the lower border of the bone and then pushes it gently forward in a slightly inward direction toward the spine for about 1½ cm. (3/4-inch) (Figs. 5, 9 and 10). At various depths the fluid, 8 to 10 c.c. in all, is injected. In this process the nerves most likely often are hit and their substance directly imbibes the novocaine solution. But this leaves no deleterious effect. Step by step, with the same technic and continued care, the respective ribs are treated. One must remember that when attending to the upper ribs, the increasing thickness of overlying soft tissues makes the needle sometimes pass to a depth of nearly 5 to 6 cm. (2½ inches), before it strikes the bone. When the last rib above—according to previous determination—has been attended to, it is necessary to wait for 15 to 20 minutes before starting to make the incision—the important point which I would like to particularly emphasize once more. The mistake we all are prone to make—thereby depriving ourselves and the patient from reaping the full benefit of the regional anæsthesia—is, that, owing to lack of time, we cut down these minutes.

Complications, such as puncturing blood-vessels or the lung, have not been observed. Neither method appears to be connected with danger to the patient. Kappis has seen that when the needle pricked the pleura, the patient suddenly began to cough. He withdrew the needle somewhat, giving it a different direction, and no harm resulted.

The strength of the solution should be ½ per cent. This was used at Zurich with satisfactory results. Kappis employed a 1 to 1½ per cent. solution but states that he intends to reduce the strength. In one of my cases a most profound collapse occurred after liberal use of a one per cent. novocaine solution, about 80 to 100 c.c. The operation (thoracoplasty on a bronchiectatic) had to be postponed. Six days later the ½ per cent. solution, applied in the same manner, gave a satisfactory result.

I have so far practised Kappis's method only; this for the reason that it appealed to me as anatomically particularly efficient. However, I shall not fail to try Schumacher's method as soon as an opportunity presents itself. The analgesia derived from the latter has been lauded by many

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colleagues who had a chance of seeing it carried out. The amount deposited at each rib is about 10 c.c. in both methods, as stated above.

My cases of extrapleural thoracoplasty done under regional anaesthesia, seven in number, were all bronchiectatics. The operations were done at a time when I tried the effect of this procedure in advanced, non-tuberculous suppurative affections of the lung; in three of them branches of the pulmonary artery had been ligated at the first stage. I have been much pleased with the working of the anaesthesia; now and then a few whiffs of an anaesthetic were required, especially in reduced nervous individuals.

In one case, a thoracoplasty requiring resection of the first to the tenth rib, an ideal regional anaesthesia—without the addition of any inhalation—was obtained, the patient conversing during the entire operation, never once complaining of pain.

Extrapleural thoracoplasty for advanced pulmonary tuberculosis—the real field for this operation—I have not been able to carry out so far, owing to the impossibility of getting such patients admitted to the hospitals with which I am connected. All my efforts in this direction within the last five years were thwarted. However, I am glad to be able to add, that it is now planned at the German Hospital to have two rooms in the Thoracic Pavilion set aside for this class of patients.

The fact that more than 66 per cent. of these otherwise entirely hopeless cases have been greatly improved or cured at the hands of surgeons abroad by such compression from without, with the help of thoracoplasty, should serve us as a stimulus to find ways and means by which it may become possible to afford patients of this type the opportunity of benefiting by operative procedure, thus saving at least a number of them from certain death.

Regional anaesthesia has been successfully applied by me so far in only one patient with advanced pulmonary tuberculosis with cavity formation in the left upper lobe, on whom I performed Tuffier's operation. Here, after resection of a piece of the third rib in the anterior axillary line and division of the posterior lamella of the rib periosteum plus endothoracic fascia, the costal pleura was gently pushed off the chest wall, including the apex of the lung, and then a paraffin-plumb introduced.

The same method of regional anaesthesia has been many times carried out in single or multiple rib resection for empyema, in pneumotomy for lung abscess, exploratory thoracotomy for lung tumor and for ligation of a branch of the pulmonary artery. In one of the latter cases the patient, an intelligent young man, was conscious during the entire operation. Only at the time of opening his pleural cavity, which showed no signs of chronic inflammation, a small amount of an anaesthetic had to be administered.

There can be no doubt that regional anaesthesia represents a great asset in the successful performance of extrapleural thoracoplasty as well as in some intrathoracic operations.

## THE ADVANTAGE OF CHOLECYSTECTOMY IN THE AVOIDANCE OF ADHESIONS IN GALL-BLADDER SURGERY

BY A. MURAT WILLIS, M.D.

OF RICHMOND, VA.

I HAVE long been impressed with the much greater frequency of adhesions following gall-bladder surgery than elsewhere in the abdominal cavity.

Not only are adhesions constantly present after drainage, but their extent and severity are often entirely out of proportion to the primary pathology and the nature of the operation done.

The effect of gall-bladder adhesions in producing subsequent symptomatology varies markedly in different individuals. In cases with severe pathology, such as acute cholecystitis with stones, the relief obtained from simple drainage is often complete and permanent; while in others with only a mild but definite cholecystitis, the results of operation, so far as local comfort is concerned, are not infrequently disappointing. The fact, however, that adhesions undoubtedly follow both of these types, leads one to the conclusion that variations in the degree of post-operative discomfort are to a certain extent dependent upon the patient's temperament; in other words that the relative relief in the one class is so great as to cause less severe symptoms to be overlooked, while in the other the disposition of the individual tends toward exaggerating his complaint.

During the past few years, I have been struck with the number of our cholecystostomies returning to us for treatment, and furthermore the literature on the subject convinces me that this operation has, in the hands of other surgeons, proven unsatisfactory in a considerable proportion of cases. This fact has been largely responsible for popularizing the operation of cholecystectomy which is now being widely advocated.

I have thought for some time, although I have never tried to prove my belief, that bile would stimulate adhesions if it came in contact with tissues not surrounded by epithelium. With this in mind, and also keeping before me the failure on the part of cholecystostomy to alleviate certain low-grade infections of the gall-bladder, I have been conducting in dogs a series of experiments which for all practical purposes may be divided into five groups. (1) Cholecystectomy without the spilling of bile in the abdominal cavity. (2) Cholecystectomy with the emptying of bile in the abdominal cavity. (3) Cholecystotomy with drainage. (4) Cholecystectomy with bile infected with *B. typhosus* smeared over gall-bladder area. No drainage. (5) Cholecystostomy in a gall-bladder previously infected with *B. coli*.

If my results are to be relied upon, I think it reasonable to assume that in some dogs bile may stimulate a moderate amount of adhesions, while in other dogs bile may institute a profuse fibro-elastic tissue reaction in the peritoneal cavity.

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*Experiment 1.*—Control. Cholecystectomy without the spilling of bile and without drainage.

- (a) Mongrel, bitch, puppy. Cholecystectomy. September 13. Died with distemper October 3. No adhesions. Nine days.
- (b) Mongrel, dog, puppy. Cholecystectomy. September 23. Died with distemper October 3. No adhesions. Ten days.
- (c) Bull, bitch, puppy. September 23. Killed October 20. No adhesions. Twenty-seven days.
- (d) Fox-terrier, dog. Cholecystectomy. September 23. Killed October 20. Few adhesions about the liver in gall-bladder region. Twenty-seven days.

In this series only one dog exhibited adhesions, and these were insignificant. Other dogs dying at nine, ten and twenty-seven days respectively showed no adhesions.

*Experiment 2.*—Cholecystectomy. Contents of gall-bladder emptied into abdominal cavity.

- (a) Mongrel, bitch. Cholecystectomy. September 22. Died with distemper October 1. Numerous fresh adhesions about the gall-bladder region. Eight days.
- (b) Fox-terrier, bitch. Cholecystectomy. September 22. Killed October 20. No adhesions. Twenty-eight days.
- (c) Fox-terrier, dog. Cholecystectomy. September 22. Killed October 20. Few adhesions about stomach, liver and duodenum. Twenty-eight days.
- (d) Mongrel, dog. Cholecystectomy. September 22. Killed October 20. Stomach, liver and colon matted together with numerous adhesions. Twenty-eight days.

In this series one showed no adhesions at the end of twenty-eight days. Two showed a moderate number of adhesions on the eighth and twenty-eighth day respectively, and one showed numerous adhesions on twenty-eighth day.

*Experiment 3.*—Cholecystotomy with drainage.

- (a) Shepherd, bitch, puppy. Cholecystostomy. September 24. Died with distemper October 6, 1915. Numerous adhesions in gall-bladder region. Twelve days.
- (b) Mongrel, bitch. Cholecystostomy. September 24. Numerous adhesions about stomach, liver, small intestines, anterior abdominal wall, etc. Twenty-six days.
- (c) Fox-terrier, bitch. Cholecystostomy. September 24. Killed October 20, 1915. Numerous adhesions in gall-bladder region. Twenty-six days.
- (d) Mongrel, bitch, puppy. Cholecystostomy. October 1. Killed October 20. Liver, stomach, duodenum, colon and omentum matted together with numerous adhesions.

In this series three showed numerous adhesions on the sixth, twenty-sixth and twenty-sixth days respectively, and one showed a veritable mass of adhesions on the ninth day.

In the above experiments normal bile was employed. We thought it well to inject *B. typhosus* and *B. coli* into the gall-bladder, and later to spill some of the bile in the abdominal cavity in the region of the gall-bladder.

## ADVANTAGE OF CHOLECYSTECTOMY

*Experiment 4.*—Cholecystectomy with bile infected with *B. typhosus* smeared over gall-bladder area. No drainage.

(a) Mongrel, bitch, puppy. Cholecystectomy October 12. One-half c.c. of the bile culture of typhoid fever smeared over gall-bladder area. Killed November 1. Many adhesions in gall-bladder region.

(b) Mongrel, dog. Cholecystotomy October 12. *B. typhoid* injected into gall-bladder. Cholecystectomy October 20. No drainage. Small amount of bile spilt at seat of operation. Autopsy November 7. Many adhesions in gall-bladder region.

We did not drain the dogs injected with typhoid because of the danger attached to such a procedure.

*Experiment 5.*—Cholecystostomy in a gall-bladder previously infected with *B. coli*.

(a) Mongrel, dog. Cholecystotomy October 12. *B. coli* injected into the gall-bladder. Cholecystostomy October 20. Autopsy November 7. Adhesions in upper abdomen numerous. Greatest number at gall-bladder area.

(b) Mongrel, bitch. Cholecystotomy October 15. *B. coli* and *Staphylococcus aureus* injected into gall-bladder. Cholecystostomy October 24. Autopsy November 12. Stomach, liver, etc., were matted together with adhesions.

In series four and five the number of adhesions was greater than in the preceding experiments where normal bile was used.

It is not always easy to recognize a diseased gall-bladder. Chronic catarrhal inflammation, or the so-called strawberry condition, may exist, and yet viewed from the serous surface the gall-bladder looks and feels perfectly normal, and it empties with little or no difficulty.

What shall we do for these individuals if their symptoms point to a gall-bladder infection? Shall we explore and drain the gall-bladder? Shall we remove it? Shall we leave it alone?

The ideal operation would be to explore these uncertain gall-bladders, and if no pathology be present close them and drop back into the cavity. However, it is impossible to open and explore a gall-bladder without soiling the surrounding peritoneal surfaces with bile. Therefore, this exploration is followed by crippling adhesions regardless of whether the gall-bladder is diseased or healthy, or whether it is followed by cholecystectomy or cholecystostomy.

In my judgment the gall-bladder should not be explored by incision, but in those uncertain cases it is better to do a cholecystectomy without drainage.

In a well-performed cholecystectomy where no bile is spilt in the cavity and no drain of the liver is used, the trauma of operation seems to be an insignificant factor in stirring up adhesions. On the other hand, in cholecystostomy and cholecystectomy where we use a drain, and have a spilling of bile, adhesions invariably follow. We all know that foreign bodies stimulate a production of fibro-elastic tissue; from the results of my experiments, I feel that bile is an important factor in the production of adhesions, and that it is of the utmost importance that the irritating and often infected bile should not be allowed to come in contact with peritoneum.

## POSTURE IN CASES OF ABDOMINAL DRAINAGE\*

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IT is a generally recognized fact that the posture in which patients are placed after operations for septic abdominal conditions, is an important factor in their recovery. It is well to remember that surgery demanding abdominal drainage is the surgery of delay. Oftentimes the vitality of a patient is seriously impaired before the case is turned over to a surgeon, and the margin tending towards a safe operation may be very small or entirely absent. In all cases where drainage is necessary, there is one vitally important point to be kept in mind, and that is the fact that drains are usually effectual for but a little more than twenty-four hours. Their effectiveness is at its maximum immediately after operation, and this tends to lessen from hour to hour. Unless sufficient drainage takes place in the first few hours, the patient is likely to die from peritonitis or sepsis. It will thus be seen that in the gravest surgical cases it is of the utmost importance to secure at once an unobstructed outflow of all toxic fluids from the abdomen. It must also be remembered that a drain is likely to affect only a small area. Consequently, a number of drains must be used.

The various methods of drainage of the abdomen that have been employed at different times, are familiar to all. The first really great advance towards modern methods of abdominal drainage, was outlined in a paper read by Dr. Murphy, at the Atlantic City Meeting, of the American Medical Association, some years ago. Murphy at that time reported 16 cases of appendicitis with peritonitis, with 15 recoveries. His paper was accepted with marked reservation and it was only after years of experience that we realized his ideas were in the main correct. He advocated the Fowler or sitting position and the use of normal saline by proctoclysis, so as to convert, as he said, the peritoneum from an absorbing to a secreting surface. Dr. Murphy considered the Fowler position of first importance, because it allowed all fluids to gravitate into the pelvis, where the activity of the lymphatics is not so great as in the region of the diaphragm. By keeping the patient in an elevated position all fluids are thus brought into the pelvis and enabled to escape more readily by means of a drain placed in the cul de sac of Douglas. The lower rate of absorption in this region allows more time for the peritoneum to dispose of all poisons that are not expelled through the drain.

The greatest factors in abdominal drainage are gravity, intra-abdominal pressure, and capillary attraction. Of these, undoubtedly, the most im-

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\* Read before the Western Surgical Association, December, 1916.

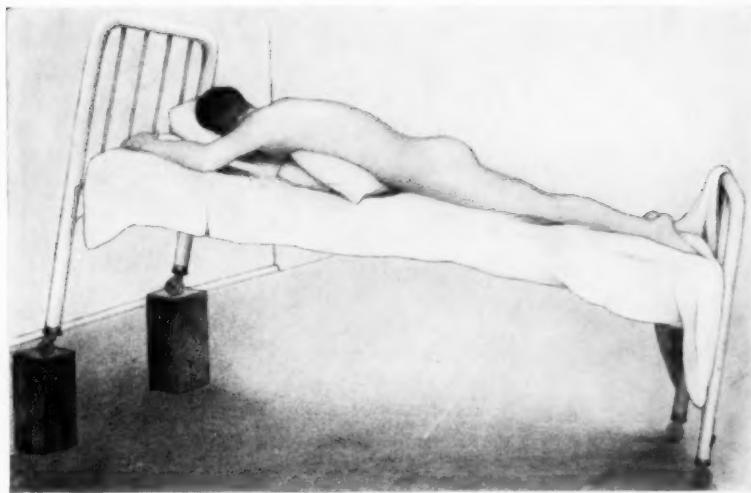


FIG. 1.

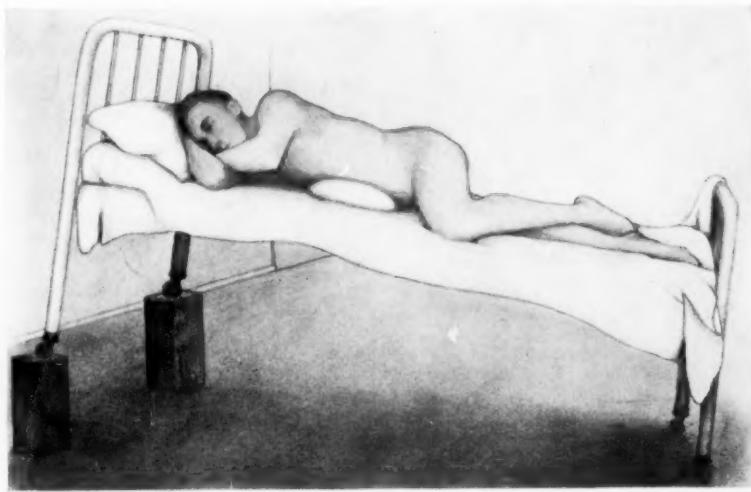
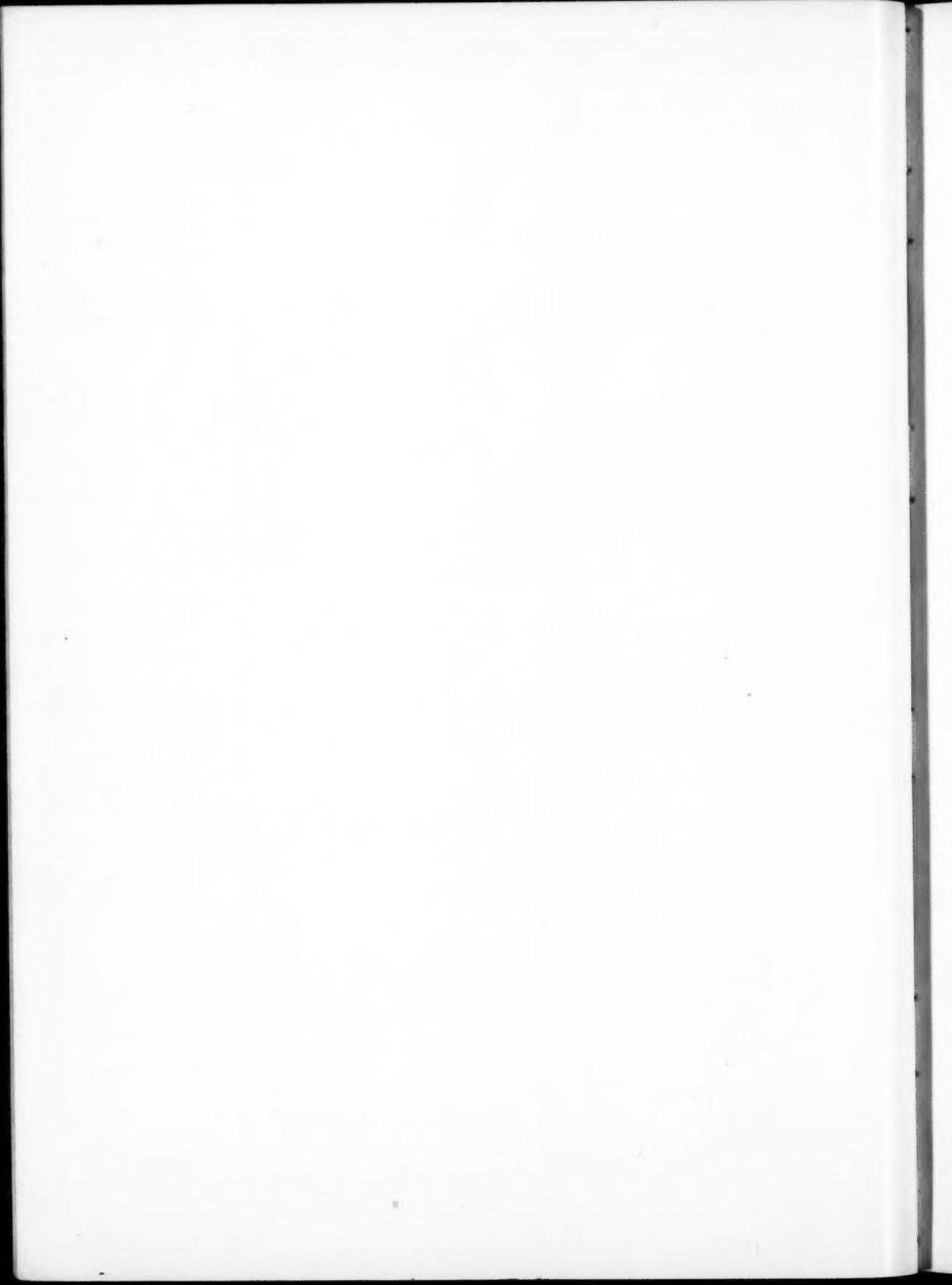


FIG. 2.



## POSTURE IN CASES OF ABDOMINAL DRAINAGE

portant is gravity, the full value of which we do not believe has always been secured. There are three definitely recognized positions used in treating these cases, and each seeks to secure to the utmost the influence of gravity. These positions are: 1st, The Fowler position as advocated by Fowler and later by Murphy. 2d, The prone position, or what is known as ventral decubitus. 3d, The lateral position, where the patient is placed on the side. The Fowler position is the one most commonly employed throughout the country. It has a number of disadvantages that must be taken into consideration. As Coffey has shown, it is necessary to raise the patient so that the long axis of the abdominal cavity is at an angle of 60-70 degrees on the horizon, before the spaces in front of the kidneys will drain into the pelvis. This position tends to throw a decided strain upon a patient with an already weakened heart and lowered blood pressure. Furthermore this position favors gastric distention with its associated ill results. Moreover in the Fowler position the pelvis is lower than the pelvic arch and the escape of pus takes place by siphonage.

In regard to the prone position, some years ago one of the resident staff at the St. Louis City Hospital made the observation, that he thought if a patient were placed on the abdomen, drainage would be more effectual than in any other way. The plan looked feasible and was tried out so successfully that a number of the staff now use it as a matter of routine. As it is now carried out the patient is placed on the abdomen usually for from twenty-four to forty-eight hours, with the head of the bed elevated about 10 or 12 inches. A pillow is placed under the lower part of the chest, and one is placed under the head, so as to give the patient ample room to breathe. The principal objection to this position is that it is not comfortable. Our observations lead us to believe, however, that it is not nearly as uncomfortable as one would suppose. By this position we get the maximum effects of gravity, intra-abdominal pressure, and capillary attraction. In addition to this there are no spaces in the front of the abdomen to favor the formation of pockets, as there are in the pelvis and alongside of the spine. The pus is also brought against an area of the abdomen where blood-vessels and lymphatics are not nearly so numerous as they are in the pelvis. We believe this to be a very important factor, as it would seem that absorption would take place more slowly here than in any other part of the abdomen.

The lateral position, in which the patient is placed on the right side, we have found to be very efficient. In this position the head of the bed is slightly elevated, and a pillow is placed under the region of the liver, so as to prevent any space for accumulation of fluid in the kidney region. The patient is turned over far enough so that pus will drain from in front of the left kidney. In a series of interesting experiments on the cadaver, Dr. Coughlin has shown that this posture when properly employed will probably allow a more perfect escape of fluid than any other.

In an analysis of 104 drainage cases that have been operated upon at the St. Louis City Hospital during the last year and a half, I find that the

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three positions have been employed with sufficient frequency to warrant us in drawing some conclusion as to the relative merit of each.

In a series of 15 cases treated in the lateral position, there was an absence of mortality. Of these 15 cases there was one of eight months pregnancy, with ruptured gangrenous appendix and peritonitis, there were six cases of acute appendicitis with perforation, four cases of appendiceal abscess, and four cases of acute appendicitis.

In a series of 42 cases treated in the abdominal position, there were but two deaths. An analysis of this series shows that in eleven cases localized abscesses had formed. Nineteen are recorded as cases of perforated appendicitis, and in addition to this there were five cases in which general peritonitis had developed. Seven cases were cases of acute appendicitis, and of these all but one were gangrenous or suppurative.

In the 47 cases treated in the Fowler position there were five deaths. An analysis of this series shows that there were ten cases of appendiceal abscess; seven cases of perforated appendicitis with general peritonitis, and eight cases of ruptured appendix. Seventeen were cases of acute appendicitis and one was a case of acute appendicitis with pelvic peritonitis. Two were cases of chronic appendicitis (evidently recurrent cases). One with cholecystitis is recorded. There was one case of general peritonitis with abscess of liver, and one case is listed as progressive peritonitis.

In the treatment of these cases, peristalsis is controlled by the use of opiates and absolutely nothing is given by the mouth. The necessary water is introduced into the system by the Murphy method. Formerly we used normal saline, but in view of the fact that salt puts some strain on the kidneys, we now use a solution of glucose and soda. Glucose is a carbohydrate of high caloric power that is easily burned off in the system and tends to keep up the strength of the patient. The soda is added because of the tendency to acidosis that follows all severe cases. Formerly we used bicarbonate of soda, but lately we have been using the citrate. The strength of the solution is 3 per cent. glucose and 2 per cent. soda solution.

The materials used in drainage of abdominal cases, I believe to be important. Formerly glass tubes were employed, but it was found that they had two distinct disadvantages: First, They were hard and would tend to ulcerate through the bowel and form a fistula if left in too long. Second, They have also been known to break off inside of the abdomen. This happened in a case of my own in which I operated upon a colored man for five perforations of the small intestine caused by gun shot. The peritoneum was opened, the perforations repaired and a glass tube inserted into the pelvis. A few days later in removing the glass tube I found that it had broken off and a part of the tube almost two inches or more was left in the abdomen. This necessitated a further operation which fortunately was successful and the patient recovered. At the present time we prefer a large slit rubber tube with a small wick in it with one or two additional drains of rubber dam wrapped around wicks of gauze after the plan suggested by Robert T. Morris of New York.

## POSTURE IN CASES OF ABDOMINAL DRAINAGE

In conclusion I wish to state that I believe posture to be an important factor in the recovery of the severe cases of abdominal drainage. At the same time the whole after treatment is of the greatest importance, and the position alone will be of no avail unless the giving of food by the mouth is strictly prevented. In fact the principles of the so-called Ochsner treatment should be most vigorously applied after operation if we are going to secure the best results in these very interesting and but too often desperate cases.

In closing I wish to emphasize the fact that the series of cases reported here came from a stratum of society where personal neglect is the rule. Many of these patients were poorly nourished and sadly neglected and entered the hospital only as a last resort. If we take these facts into consideration and then remember that there were only two deaths out of 57 cases treated in the prone position and on the side, I think you will infer not only that the record is an excellent one but that the posture in which the patients were placed contributed materially to their recovery.

OPERATIVE TREATMENT OF HOUR-GLASS STOMACH  
WITH REPORT OF A CASE TREATED BY DOUBLE POSTERIOR GASTRO-ENTEROSTOMY

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New York Hospital)

THE operative treatment of hour-glass stomach dates from 1889 when Bardeleben first performed a gastroplasty with a fatal result. Gastroplasty was later successfully performed by Krukenberg in 1892. This operation, alone, can only be performed when the pylorus is normal, and in a study of a series of cases treated in this manner Patterson found that in at least twenty-five per cent. the remote results were very poor.

Gastrogastrostomy, first performed by Wolfler in 1894, is likewise unsatisfactory and in addition is dangerous in the presence of much tension.

Digital divulsion or dilatation is no longer considered a justifiable procedure, although a few cases have been reported with moderate success.

In a small percentage of cases the constriction is caused by cancer and here resection should be performed if practicable.

Posterior gastro-enterostomy using the cardiac pouch may be performed with success providing the pyloric pouch is relatively small and the pylorus is normal.

In view of the fact however that many cases of hour-glass stomach due to ulcer also have similar lesions at the pylorus, it is evident that no single operation will effect a cure. It has therefore been the custom of many surgeons to combine posterior gastro-enterostomy or pyloroplasty with either gastrogastrostomy or gastroplasty.

Von Hacker, in 1895, and Weir and Foote,<sup>1</sup> in 1896, suggested double posterior gastro-enterostomy in the treatment of hour-glass stomach. Hartmann reported a case with successful result before the International Surgical Association in April, 1914, and another case was reported by Van Beuren<sup>2</sup> before the New York Surgical Society, November, 1916.

In view of the fact that gastroplasty is often unsuccessful in widespread ulcer and gastrogastrostomy is relatively dangerous in the presence of much tension it would seem that double posterior gastro-enterostomy is a logical operation and is definitely indicated in certain cases. Because of the rarity of such cases in the literature it has seemed advisable to publish the following successful case.

M. D., woman, aged forty-two, Irish, housewife, was referred to the Cornell division of the New York Hospital for gastric study by Dr. Thos. Stone, February 5, 1917, on account of epigastric pain, vomiting and loss of weight. Her family history has no bearing on the case.

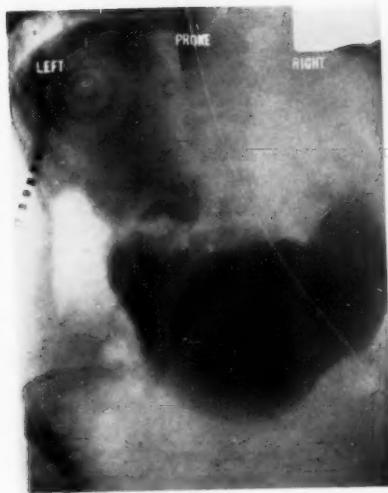


FIG. 1.—Röntgenogram of stomach before operation immediately after ingestion of bismuth, showing great dilatation of pyloric pouch. Position in photograph is reversed.



FIG. 2.—Röntgenogram of stomach before operation, taken twenty-four hours after ingestion of bismuth, showing retention in pyloric pouch.



FIG. 3.—Röntgenogram of stomach three months after operation, showing hour-glass contracture and bismuth in both pouches. Position in photograph is reversed.



FIG. 4.—Röntgenogram of stomach three months after operation, taken one hour after ingestion of bismuth, showing both gastro-enterostomy openings working well. Position in photograph is reversed.



FIG. 5.—Röntgenogram of stomach three months after operation, taken five hours after ingestion of bismuth, showing stomach practically empty. Position in photograph is reversed.

## OPERATIVE TREATMENT OF HOUR-GLASS STOMACH

*Past History.*—She has always been well except for attacks of measles and pertussis in childhood. During the past thirteen years she has been troubled with carious teeth and pyorrhœa. Aside from chronic constipation she has had no gastro-intestinal symptoms previous to the onset of present illness. She received a perineal laceration at the birth of her first child ten years ago and suffered from a uterine prolapse for several years until May, 1916, when she was operated upon in another clinic, operation consisting of perineorrhaphy, ventral fixation of uterus and appendectomy. Her average weight was one hundred forty pounds until about five years ago when she began to lose weight, which she attributes to the prolapsed uterus and accompanying symptoms. In 1915 she weighed one hundred twenty-one pounds. Previous to admission she weighed about eighty pounds.

*Present Illness.*—Began two and one-half years before admission with epigastric pain accompanied by gaseous eructations, occurring about three hours after the noon-day meal and continuing until about eleven P.M. Her symptoms gradually increased in severity. Pain was relieved by vomiting and by taking sodium bicarbonate until about one year before admission when these measures ceased to give relief. No haematemesis or melæna. Patient has recently noticed splashing in stomach and peristaltic movements in upper abdomen. Five weeks before admission pains came on three to four hours after breakfast and were so severe that she was unable to eat dinner or supper. During this time she lost weight rapidly.

*Physical Examination.*—Fairly well developed medium sized woman who is markedly emaciated, appearing chronically ill. Skin and mucosæ are slightly pale. Heart and lungs are normal. Abdomen is relaxed and scaphoid. There is a bulging tympanitic area in upper half of abdomen corresponding to the position of a dilated stomach. Here peristaltic movements can be seen traveling from left to right and ending under right costal border. Clapotage present. There is a palpable movable mass about the size of a lemon just above and to right of umbilicus. Liver and spleen are not palpable. Kidneys are just palpable. Genitals normal. Knee jerks are present and equal. Wassermann test in blood negative.

As her symptoms were obviously gastric in origin she was at once referred to the department of röntgenology and a barium series of plates were taken, which definitely showed an hour-glass stomach (Figs. 1, 2, 3).

*Operation (February 10, 1917).*—By Dr. Charles L. Gibson, Laparotomy to the right of midline five inches long. There is a huge stomach, the pyloric pouch of which is about three times the size of the cardiac pouch. The constriction between the two pouches is due to cicatrization of a large ulcer which forms a tumor nearly the size of a hand. Pylorus is obstructed by a similar large callus, apparently cicatrized ulcer. A small node lying on the pylorus was excised for examination. (Microscopical report normal.) Double posterior gastro-enterostomy is done, one in the cardiac pouch without clamps using five rows of sutures, three posteriorly and two anteriorly using silk for the first and last and fine chromic gut for the other three. The same

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loop of intestine is used five inches away for a second gastro-enterostomy in the pyloric pouch a little more than midway in the pouch, nearer to the pylorus. This gastro-enterostomy done with tongue depressor clamps,<sup>3</sup> otherwise technic the same. Suture of incision in meso-colon to stomach in both instances. Closure of abdominal wall in tiers reinforced by four silkworm-gut sutures.

*Subsequent Course.*—Recovery uneventful. On the sixth day patient was taking soft-solid diet and on the tenth day she sat up in a chair. Weight twelve days post-operative, eighty pounds. Discharged March 5, 1917, having gained about a pound a day and absolutely free from symptoms.

Patient returned in the follow-up clinic<sup>4</sup> on May 7, 1917. She is absolutely free from symptoms, feels well and has gained thirty-two pounds in weight. A second barium series taken of the stomach shows that the stomach empties rapidly, being nearly empty at the end of one hour and that it is practically free from barium at the end of five hours. Both gastro-enterostomy openings are working well (see Figs. 1-5).

## BIBLIOGRAPHY

- <sup>1</sup> Weir and Foote: *Medical News*, April 25, 1896.
- <sup>2</sup> Van Beuren: *ANNALS OF SURGERY*, March, 1917.
- <sup>3</sup> Gibson: The Tongue Depressor Gastro-enterostomy Clamp. *ANNALS OF SURGERY*, May, 1915.
- <sup>4</sup> Gibson: A Surgical Follow-up System. *ANNALS OF SURGERY*, Sept., 1917.
- <sup>5</sup> Moynihan: *Abdominal Operations*, p. 277.
- <sup>6</sup> Deaver and Ashhurst: *Surgery of the Upper Abdomen*, 1909, p. 186.
- <sup>7</sup> Robson, A. W. Mayo: On Hour-glass Stomach from a Personal Experience of Twenty-three Operations. *Lancet*, Jan. 2, 1904.

## THE EXTENT OF TISSUE TO BE EXCISED FOR A RADICAL REMOVAL OF CARCINOMA OF THE STOMACH

BY WILLIAM THALHIMER, M.D.\*

AND

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THIS investigation was made for the purpose of determining the minimum amount of tissue adjacent to small carcinomata of the stomach wall which must be resected in order to secure a complete operative removal of the malignant process in those cases in which the regional lymph-nodes apparently are not involved and in which there are no demonstrable metastases.

The material studied consisted of gastric carcinomata removed by pylorectomy or by partial gastrectomy. In two cases where an inoperable carcinoma was found at operation the entire stomach was secured at autopsy, and in a third case where the first stage of an operation for carcinoma of the cardia was performed the specimen was also secured post mortem.

The specimens studied were selected from a large number, most of which were rejected because the extensive malignant involvement rendered them unsuitable for the purpose of this investigation. Several of the specimens were chosen for examination because the tumor was so situated that its mode and degree of extension could be studied, even though the carcinoma was too large to be operable.

The specimens were fixed immediately in ten per cent. formalin, and subsequently blocks were cut in directions radial and tangential to the tumor proper, both through the edges of the tumor and at various distances from it. The accompanying diagrams are self-explanatory, and show the position of the blocks. The extent of the malignant involvement is indicated by dotted areas.

*Specimen T. W. 1* (Fig. 1).—The specimen was obtained at post-mortem examination and consisted of the entire stomach in two parts. (At operation the stomach was divided in two, both ends were closed in and a gastrostomy was established into the pyloric part.) A large cauliflower-like tumor arises from the lesser curvature and extends downward on the anterior and posterior walls surrounding the cardiac orifice and on to the wall of the œsophagus for a distance of 3 cm. above the diaphragm.

*Specimen T. W. 3* (Fig. 2).—The specimen consisting of œsophagus and stomach was obtained at autopsy. The œsophagus was normal. The stomach

\* This study was carried on under the tenure of a Moses Heineman Fellowship.

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presents an hour-glass appearance with the contraction three-quarters of the way from the fundus to the pylorus, on the lesser curvature. Fibrous bands upon the serosa extend radially from the tumor. On opening the stomach the contraction is found to allow the entrance only of the tip of the little finger. On section a puckered, centrifugally-extending growth is seen on the anterior wall, and an ulcerating vegetating growth, connected to the former by a submucous band, on the posterior wall.

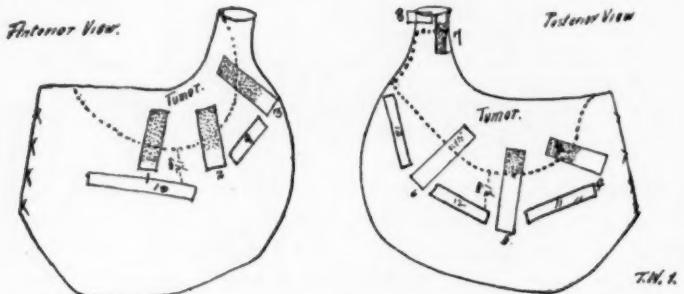


FIG. 1.

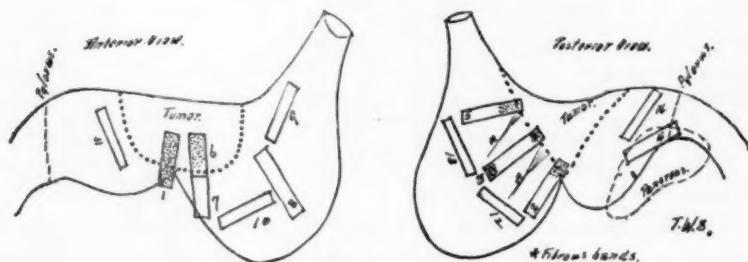


FIG. 2.

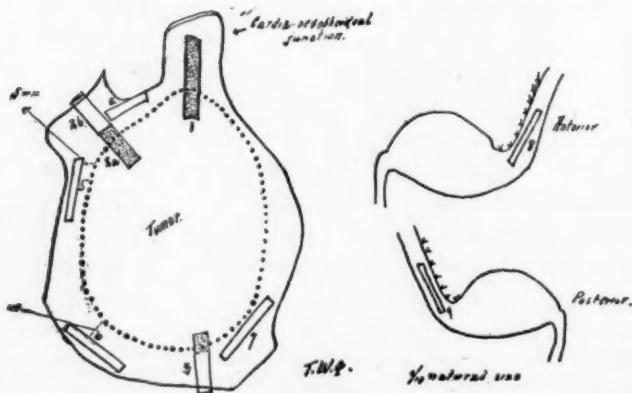


FIG. 3.

*Specimen T. W. 4 (Fig. 3).*—Specimen was obtained at operation and consists of the lower 2 cm. of the oesophagus and the adjacent portion of the stomach for a distance of 7 cm. along the lesser curvature. A cauliflower-like tumor occupies practically the entire surface of the mucosa except for a short area about 1 cm. in width, which corresponds to the posterior wall of the oesophagus at the cardio-oesophageal junction. The line of section is from 1 to 3 cm. beyond

RADICAL REMOVAL OF CARCINOMA OF STOMACH

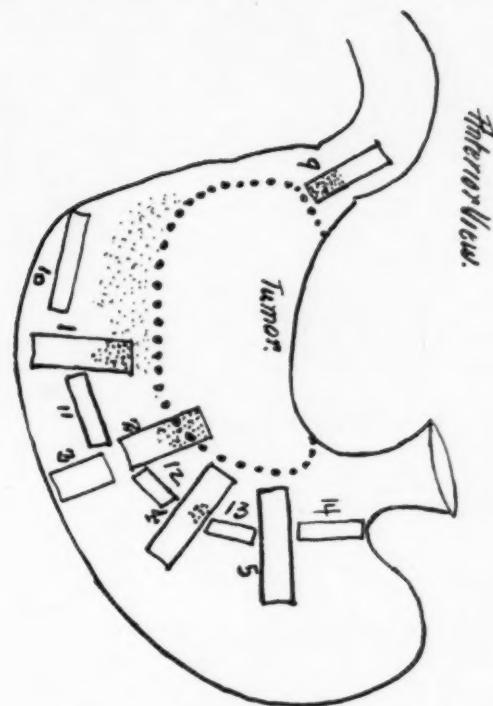
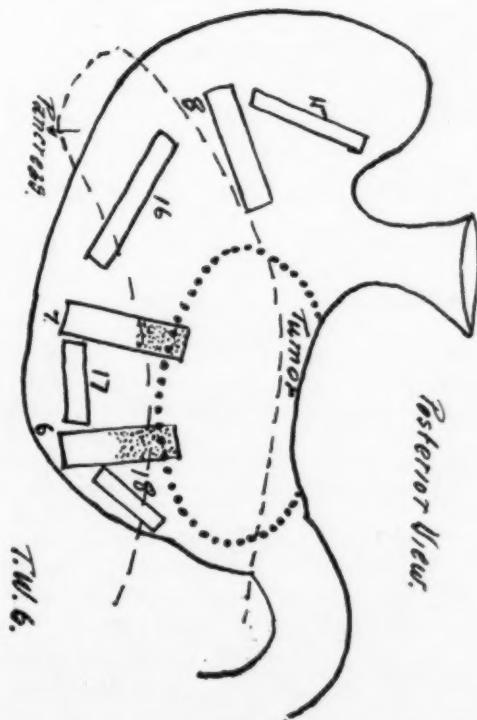


FIG. 4.



T.W. 6.

the margin of the tumor. The remainder of the stomach was obtained at post-mortem examination, and was free of tumor.

*Specimen T. W. 6* (Fig. 4).—Specimen was obtained at post-mortem examination and consisted of the entire stomach, the first part of the duodenum, the stump of the esophagus and that portion of the pancreas underlying the posterior stomach wall. Except for a distance of several centimetres at the cardiac end, the entire extent of the lesser curvature up to 1 cm. from the pyloric ring is occupied by a saddle-shaped tumor extending downward on the anterior and posterior walls half way to the greater curvature. Near the pyloric ring the tumor encircles the entire lumen.

*Specimen T. W. 7* (Fig. 5).—The specimen was obtained at operation and consists of a circumferential segment of the middle portion of the stomach about 2.5 cm. in width. (Resection in continuity.) Directly on the lesser curvature is a punched-out, ulcer-like lesion reaching downward into the muscularis. The edges of this resemble a benign ulcer. Microscopically this proved to be carcinoma. There was no lymphatic involvement.

(Many blocks, which are not charted, were sectioned for the purpose of a

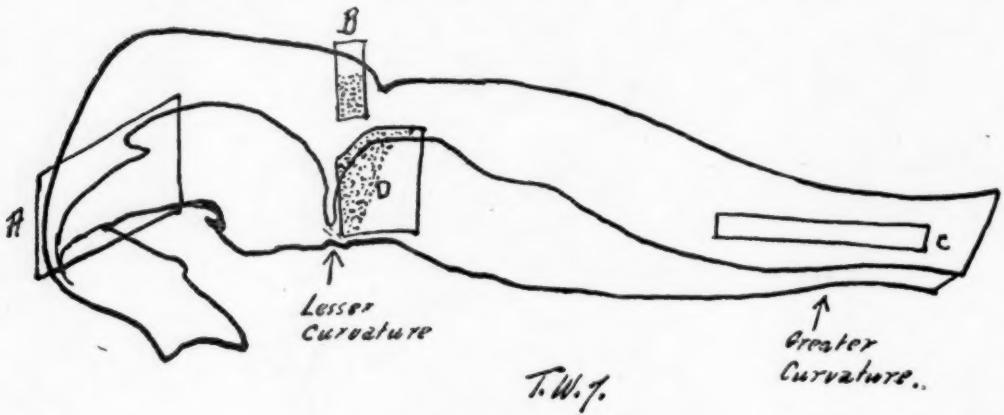


FIG. 5.

different investigation and no tumor was found beyond the area indicated in the figure.)

*Specimen T. W. 9* (Fig. 6).—The specimen was obtained at operation and consists of the pyloric two-thirds of the stomach. At the middle of the lesser curvature extending downward on the anterior wall is a punched-out defect about 4 cm. in diameter. Along the edge of this opening, small grayish nodules are seen, and the wall of the stomach bordering the defect is thickened for a considerable distance. The tumor reaches within a few centimetres of the greater curvature on both the anterior and posterior walls and reaches almost as far as the pylorus.

*Specimen T. W. 10* (Fig. 7).—The specimen was obtained by pylorectomy and consists of the pyloric antrum. The tumor is 5 cm. in diameter and surrounds the pylorus.

*Specimen T. W. 12* (Fig. 8).—The specimen was obtained at operation and consists of the pyloric two-thirds of the stomach. On the posterior wall close to the lesser curvature is a large perforation 3 cm. in diameter. The lymph-nodes along the lesser curvature are hard and shot-like.

*Discussion.*—When a carcinoma is situated at or near the pylorus, a pylorectomy accomplishes the removal of the tumor-bearing area.

RADICAL REMOVAL OF CARCINOMA OF STOMACH

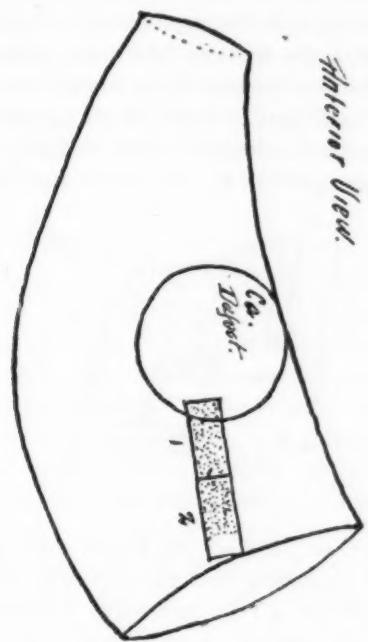


FIG. 6.



Nevertheless, in many instances the surgeon is able to go only a very short distance beyond the macroscopic limits of the growth on the duodenal side of the tumor. Since a certain number of these cases do not have local recurrences, it is evident that this narrow margin of safety is sufficient in excision of pyloric carcinomata.

When the carcinoma is situated some distance from the pylorus the surgeon has been guided by his experience with pyloric neo-

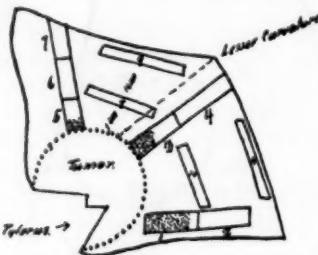


FIG. 7.—T. W. 10.

plasms, and in order to remove the tumor has had to perform a partial gastrectomy including the pylorus and a large part of the stomach as well. This is a very extensive procedure, is associated with great risk to the patient, and leaves a deformed and small segment of the stomach.

The results of the present study show that in only one instance (T. W. 3, block 3) was carcinoma found microscopically more than

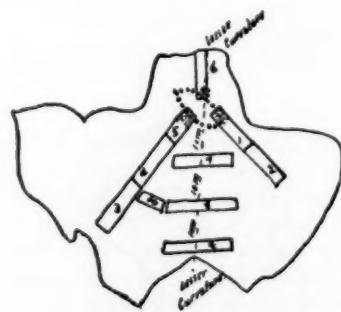


FIG. 8.—T. W. 12.

one centimetre beyond the macroscopic limits of a local carcinoma of the stomach. In this one instance the tumor, although local in nature, was nevertheless a large one and was attended by considerable cicatrization in the form of fibrous bands extending in a radial direction. As the degree of extension in this case is contrary to that found in the other specimens, it seems possible that the extension here may have been along one of the fibrous bands, even though this could not be verified.

The findings in the study of the specimen T. W. 9 show the wide

## RADICAL REMOVAL OF CARCINOMA OF STOMACH

involvement of the stomach in carcinomata of the diffuse type. These results are introduced for the sake of contrast with those obtained in local carcinoma of the stomach wall.

From the evidence submitted, it is justifiable to conclude that in small carcinomata of the stomach, situated elsewhere than at the pylorus, the malignant process is so limited in extent that local resection at a distance from one to two centimetres beyond the macroscopic limits of the tumor will in the majority of instances remove the entire tumor. Even in some of the comparatively large tumors included in the present study there was no extension of the tumor detectable by the microscope beyond this limit.

It must not be assumed from these observations that the accepted methods of surgical treatment of carcinoma of the stomach, such as a pylorectomy or partial gastrectomy, are not necessary for a thorough removal of the diseased tissue. It must be emphasized that such methods should be employed wherever possible.

The clinical significance of these investigations is twofold:

1. Inasmuch as the surgeon frequently makes a local excision of an ulcer in the belief that the latter is benign in character, these investigations show that such a local excision is sufficient for a radical removal of the malignant process even if subsequent pathological examination shows the ulcer to have been carcinomatous in character. Of course such a local excision would be radical only when metastatic glandular involvement is not present.

2. When a malignant tumor is situated at the cardiac end of the stomach, at present the surgeon may either do a complete gastrectomy or consider these cases inoperable. The serious consideration of complete gastrectomy is almost forbidden in these cases because of the high mortality of this operation. Local excision of the tumor is a far less dangerous procedure, and, since the above investigations have shown that such local excision is sufficient for the removal of the malignant process, these tumors become accessible for radical operative treatment. Of course such excision is only radical provided no metastases are present.

In the future we shall continue to examine all specimens of small gastric carcinomata removed by local excision to determine the extent of involvement and this information and the post-operative course will be reported upon in subsequent communications.

## HYPERPLASTIC PYLORIC STENOSIS

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My reason for presenting this subject is fourfold; first, I believe this condition has been and is frequently overlooked; second, I wish to bring out some of the essential features in the diagnosis; third, to comment on some of the surgical features and complications; and last, to emphasize the fact that most excellent results are obtained by surgical intervention with comparatively slight risk, and to report my cases.

Dr. E. W. Mitchell, at the 1916 Cleveland meeting of the Ohio State Society, quoted the first clinical description, written in 1788. The quaintness and clearness of this description make it worth anyone's reading. From that time until quite recent years little has appeared in the literature, but the volume of material now at hand will astound one at his first investigation. The number of reported cases is also increasing in almost arithmetical progression. This means but one thing, and that, that we are just beginning to recognize congenital hyperplastic stenosis as an entity. My own little experience has furnished more cases for operation during the last eighteen months than had previously been operated upon in all Cincinnati, and when one man (Downes of New York) reports over seventy-five cases in the last five years, we can logically conclude that many undiagnosed cases have died, either directly because the pyloric obstruction led to starvation, or indirectly because the pyloric narrowing produced a malnutrition that lowered the body resistance to other diseases.

In an earlier paper I called attention, at length, to the pathology and endeavored to prove that practically all cases of congenital pyloric obstruction have a constant pathology that rests on a far more tangible basis than any "spasm" theory. The spasm explanation is too elusive to satisfy the materialistic doctor of to-day, and I have only to point out the similarity of the obstruction symptoms produced by prostate obstruction and congenital pyloric hyperplasia, to prove the inability of spasm alone to produce the syndrome we have learned to look for in the latter condition. Prostatic hypertrophy is often present long before sudden obstruction, and yet one does not attribute the sudden obstruction to simple spasm. It is the congestion associated with a "spree," sudden chilling, instrumentation, etc., that is the last straw to close the already narrowed calibre of the urethra, surrounded by the enlarged prostate. So also the oedema from increased muscular effort, or a fold of mucous membrane, a curd of milk, may be the factor to close a pylorus already narrowed by too great an

## HYPERPLASTIC PYLORIC STENOSIS

amount of sphincter muscle. I am not attempting to explain the cause of the hyperplastic muscle (note I use hyperplastic not hypertrophic), but experiments are being carried on in Chicago in an endeavor to throw light on this phase of the subject. It is a fact, however, that I wish to make plain, that in this entire group of congenital pyloric cases there is present some hyperplasia of the circular muscle fibres; this may be just enough to be barely distinguishable from normal, or it may be so great as to practically close the pylorus. All grades between, naturally exist. One does not expect to find in any case a complete anatomical obstruction for "complete occlusion of the pylorus produces death in animals in from forty-eight to one hundred and twenty hours" (*Arch. of Int. Med.*, 1914, xiv, p. 722). There are cases having a medium amount of pyloric hyperplasia and clinically showing intermittent attacks, or periods of obstructive vomiting, which gradually disappear because the gastric muscle is able to hypertrophy enough to force the food through the incompetent pylorus, and it may be, a "used" pylorus will dilate somewhat; it is surely not a far-fetched simile to compare these cases with the cases of overloaded leaky hearts that after proper hygienic care and medication become so well compensated as to show no more symptoms. I believe the cases of so-called congenital pyloric spasm that are cured are mild cases of pyloric hyperplasia, and the intermittent symptoms can be accounted for by the explanation offered above. Experimentally "partial pyloric stenosis in dogs produces hypertonicity and hypermotility of the stomach, even if of but a few days' or weeks' duration" (*Elsesser, Am. J. of Physiology*, vol. xxxix, p. 303).

I shall not go into the symptomatology except to bring out some of the diagnostic features. A large majority of the cases are first-born males, breast fed, and perfectly well at birth. The parents are usually well and free from any detectable constitutional disease. Depending on the amount of hyperplasia of the pylorus, above referred to, the vomiting, beginning in the first days of life, or at least in the first few weeks, may be part or all of the ingested food. It is of an obstructive, forceful, explosive type, and the vomitus is expelled a foot or two through the mouth and nose. It consists of ferment-curdled milk and is never bile stained. It occurs most often soon after nursing, but in the late cases the dilated stomach may hold several feedings. The feeding and vomiting spells are associated with unmistakable evidence of abdominal pain, and, even though the infant does not vomit, it is very restless at such times. With the above symptoms, the doctor should at once expose the abdomen and look for the gastric contracting muscle waves, that are the most important diagnostic symptom. These show themselves as small rounded elevations that form at the left costal arch and travel slowly across the abdomen to the right hypochondrium, where they disappear. The size, rapidity

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of movement, frequency and visibility of these muscle waves vary greatly with the tone of the gastric muscle (not being present in the late atonic starved out case), with the amount in the stomach, the degree of the obstruction, the thickness of the subcutaneous fat layer, and other disguising conditions.

In a percentage of all cases, even those where the obstruction is the most acute, it is impossible to palpate the pyloric tumor because of the overhanging liver or the posterior position of the pylorus. If the tumor is palpable it cinches the diagnosis, if not palpable it by no means negatives the diagnosis; often the tumor becomes palpable after the little patient is anaesthetized.

All other symptoms are dependent upon the obstruction to the passage of food and fluids with the consequent malnutrition and dehydration. These infants may lose weight so rapidly as to verily melt away before one's eyes. Diagnosis should mean surgical intervention except in the milder cases. The milder cases may or may not be surgical, depending upon whether or not the gastric power becomes sufficient to overcome the obstruction, and upon how often the stomach develops or shows signs of broken compensation. These latter cases will tax the judgment of the best men, and a case thought to be medical at one time may later become surgical or *vice versa*.

A certain few cases belong in the class of emergency or urgent surgery, because of the acuteness of the symptoms and completeness of the obstruction. If the stools indicate there is considerable food passing the pylorus and weight is not being lost too rapidly, I believe a few days' effort, by one thoroughly conversant with all the intricacies of infant feeding, should be made in an attempt to correct the symptoms produced by the stenosed pylorus. How long this effort is to be carried on can only be determined by the individual circumstances. One writer says the child must not go below six pounds, but six pounds weight for a six to ten weeks' baby is a much more grave affair than six pounds weight at one or two weeks, and a birth weight at four months is far worse than a pound or two below birth weight at one month. Sunken fontanelles are danger signals, as are also very concentrated urine and meconium like stools, etc.

A child just beginning to gain under a change in food must not be dismissed or forgotten, as these periods of improvement are frequent and usually short lived. They are illusionary and raise false hopes. My own experience has been that in a case where "watchful waiting" is decided upon, the "watching" must be even more constant and efficient than in the operated cases. A child maintaining a good nutrition even though vomiting a rather large amount of each feeding, may be watched and worked with for some time, but I beg of you do not neglect to have daily weighings and do not be satisfied with a too long period of stationary weight maintenance. Give the child

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the benefit of surgical interference at a time when the surgeon is yet able to do justice to the patient and himself. I believe that these border line cases should have both a physician and a surgeon in attendance as a check on each other.

A differential diagnosis must be made from the vomiting of a simple gastric or gastro-intestinal disturbance, intestinal colic, other forms of obstruction and the various food injuries. In one of my cases it is possible we had to deal with, and should have differentiated, a condition about which there is little written; I refer to rumination or merycism. This child was about five and a half months old, had vomited since about six weeks old, so that when I saw it its weight was but little more than birth weight. There were no constitutional disease stigmata; practically everything had been tried in the line of food preparations; many antispasmodics had been used without effect upon the regurgitation. There was an absence, at the time Dr. Lamb and I saw the child, of a gastric wave, but a dilated stomach was present, and we felt the absence of the wave was due to this atony of the gastric muscle. With the long vomiting history it then seemed that a rapid exploration was justifiable. This was done, but the pyloric ring was not sufficiently thickened to satisfactorily account for the symptoms, nor was other pathology found, nevertheless the Rammstadt operation was made, and for a while we thought the regurgitation was lessening. Every effort was made to feed this child an acceptable and assimilable food, but part of the ingested food passed through the intestinal tract undigested, and part was continuously regurgitated. The child apparently sucked on some of the regurgitated food and the nurses commented upon this latter condition. The slow loss of weight continued until death occurred on the sixteenth day. At post-mortem the operative field was in perfect condition and the pylorus easily patent to my index finger. No adhesions or anomaly could be detected any place in the intestinal tract. With my present knowledge I would not operate on a similar case; "hind sight" says that this was probably a case of infantile merycism or rumination, though at the time I did not know this occurred in infants. I have reported this case in full to prevent others from making a similar mistake. This mistake has been made before, as reference in the literature associates the two conditions not infrequently. (Strauch, *A. M. A. J.*, September 21, 1915, p. 678.)

There are certain complications connected with this work on pyloric hyperplasia in infants that are well worth further observation and warrant extremely watchful care upon the part of the physician in charge. There has been forcibly brought to my attention, by two examples in personal experience, the fact that pyloric stenosis has associated with it an unduly high percentage of cases of thymus enlargement.

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My first case was rescued from what seems might have been a thymic death, by the prompt action of Dr. W. M. Doughty who happened to be at Christ Hospital at the time of an acute dyspneic attack. It was the third day after a posterior no-loop gastrojejunostomy for well-defined pyloric obstruction that the infant rather suddenly was seized with dyspnoea, stridulous breathing, became cyanotic and gave every evidence of an alarming condition. I was out of the city that day, and the nurses sent a hurry call for help. Dr. Doughty responded, picked the child up and hurried to the X-ray room where he snapped a picture and gave a treatment. The picture showed an enlarged thymus and the treatment was followed by a rapid amelioration of symptoms, so that by the next day the child was apparently no worse for its experience. The second case of this complication was in my last congenital pylorus stenosis case, operated January 4, 1917. Before operation we had commented upon the ashy color of the infant, and during the operation Dr. L. S. Colter, who was administering the ether, remarked frequently concerning the labored breathing and the cyanosis. Physical examination of the chest by Dr. Frank Lamb did not bring out a detectable widening of the mediastinum. The special nurse on the case was instructed to watch particularly the respiratory symptoms; after about ten days I ordered an X-ray picture of the chest so as not to overlook a possibly enlarged thymus, and that day the child manifested considerable dyspnoea and respiratory embarrassment. An X-ray picture by Dr. Doughty showed a distinctly enlarged gland, and subsequent treatment has brought complete relief.

In talking to others I have found five cases, operated by five different men in Cincinnati, where sudden death followed successful operation for congenital pyloric stenosis. Two of these cases were proven to be thymus cases at subsequent post-mortem; in one a few days after the operation the thymus was nearly three times the normal size, and in the other, a few months after operation, the thymus was over three times normal size. The other three cases died suddenly with thymic symptoms but the thymic enlargement was not proven. Seven such cases, in the small circle of my observation and in a field so limited as congenital pyloric stenosis, are all out of proportion and there must be some relationship other than coincidence. To support this latter view the literature of congenital pyloric stenosis contains rather frequently such statements: "These children are prone to sudden death." "Death occurs unexpectedly." So far I have not been able to find any explanation in the literature as to the cause of these deaths. One cannot refrain from asking what, if any, is the relationship between thymus enlargement and pyloric muscle hyperplasia?

A complication of less seriousness, but very annoying, is the

FIG. 1.

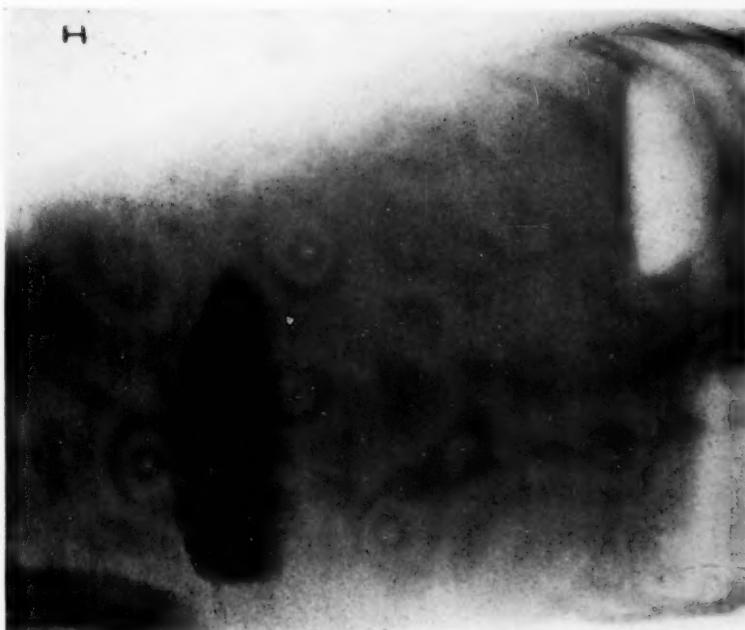
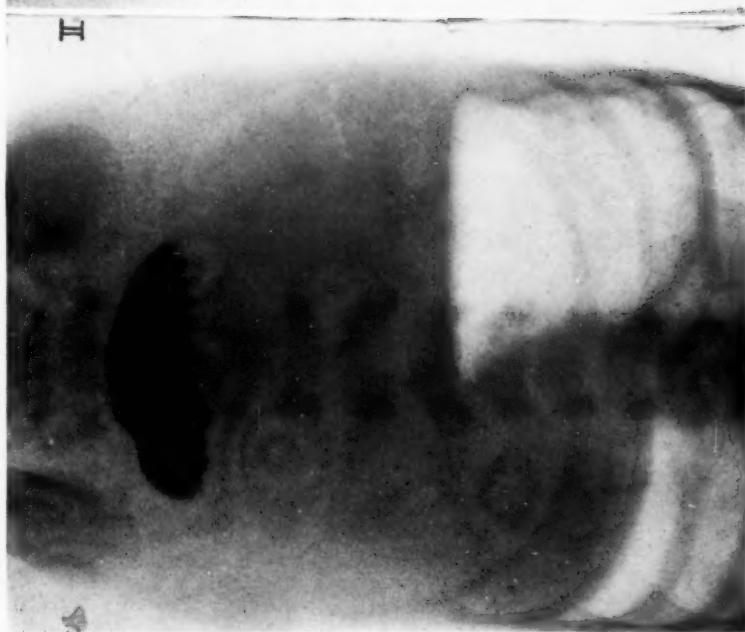


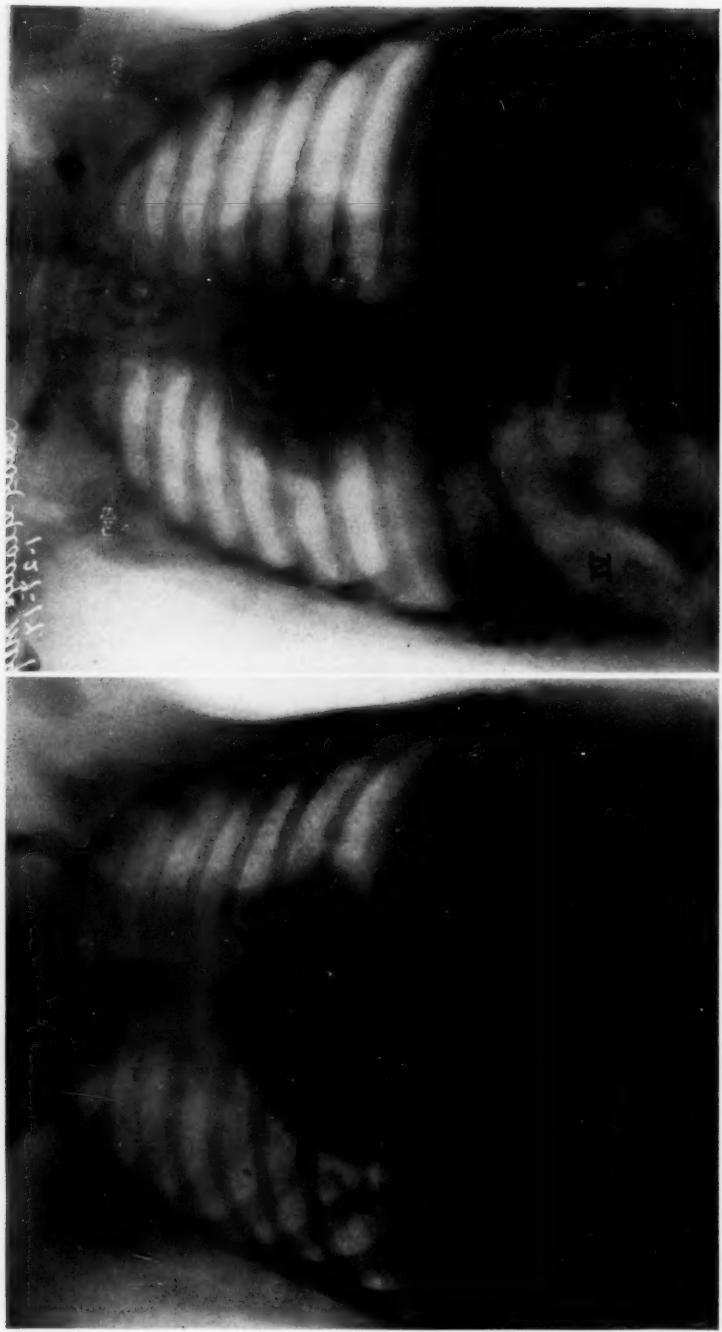
FIG. 2.



Figs. 1 and 2.—Baby D., forty days old. Note huge dilated stomach; three layers—bismuth, fluid, air. Poor risk, as stomach was atonic. Doubled weight in two months after operation. Fig. 2 was taken one hour after Fig. 1. Vomited in interval. Almost complete stenosis.

FIG. 3.

FIG. 4.



FIGS. 3 and 4.—Baby M. Second reported thymus case. Note broad thymus shadow (Fig. 3) as compared with normal shadow (Fig. 4) two weeks later, after two treatments.



FIG. 5.—Baby T. D., three months old. Very marasmic. Died without operation. Note failure of flaccid stomach to contract on bismuth meal.



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danger of oozing from the skin wound during the first twenty-four hours post-operative. In one case this was alarming and necessitated local astringents and horse serum hypodermically. Remembrance that it takes but a few cubic centimetres loss of blood to throw the balance against these starved dehydrated babies, should make one adopt every precaution, and it is wiser to use a haemostatic button-hole suture in the skin closure with a very small dressing of gauze to insure the prompt detection of bleeding. This tendency to bleed also shows itself at the pyloric incision in the Rammstadt operation. Considerable care is necessary to avoid vessels in this incision and every effort must be made to stop the oozing before the pylorus is dropped back into the abdomen. In dividing the circular muscle fibres of the pylorus great care must be used to avoid injury to or puncture of the mucous membrane on the duodenal side of the pylorus. The change from the thick pylorus to the very thin duodenum is so abrupt as to make this point the one dangerous place in the operation. In the case diagnosed rumination I made a very small puncture wound of the mucous membrane, but was able to close it perfectly, as previously shown in the post-mortem report.

Practically all my cases have shown a tendency to wound secretion and induration with redness of the wound beyond that which is usual in laparotomies. This secretion is sufficient to require daily dressing of the wound for two to fifteen days and alcohol (70 per cent.) is best for this purpose. No wounds have suppurated and all have ultimately healed perfectly. I have attributed this tendency of the wounds to the inability of the delicate tissue to take care of the suture material.

In the first three cases operated upon I did a posterior-no-loop gastrojejunostomy with small clamps and suture. These three cases are well to-day and I had no reason for seeking another type of operation other than the feeling that the technical difficulties of a gastro-enterostomy were sufficiently great, in a six to seven pound baby, to make it a very serious procedure. These disadvantages include a too great exposure of the abdominal contents with danger of unexpected evisceration, length of operation, increased shock, dangers from peritoneal soiling due to sutures tearing out, increased chance for bleeding, radical change of the anatomy of the gastro-intestinal tract, and forced delay in feeding by mouth in the already starved child. The Rammstadt pyloroplasty operation overcomes all these disadvantages, but in my cases there has been a tendency to spit up a mouthful or so of the feeding, for a few days to a couple of weeks, post-operative. The forced, explosive, projectile vomiting is immediately corrected but the tendency to slight regurgitation is much greater than in the more formidable operation where spitting up occurred but once or twice in each of the cases. This alarms no one except the

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anxious mother, unless the mother is forewarned. Other symptoms, as pain, gastric wave, loss of weight, etc., are promptly relieved. One case, the daughter of a physician, continued to spit up as long as the child was in the hospital, during which time the mother's milk was carried in bottles from the home; as soon as the baby was taken home and received the nourishment direct from the breast all spitting up of food ceased immediately. Grulee, of Chicago, has called attention to this phenomenon and offers the suggestion that there may be some change in the chemistry of the milk through the action of light rays. Following the Rammstadt operation diluted food may be given as early as three hours after operation.

Since September, 1915, I have seen thirteen cases of congenital pyloric obstruction. In three of these further observation was advised; one died suddenly while we were waiting for the mother's permission to operate, and of the remaining nine, on three a gastrojejunostomy was made, and on six the Rammstadt operation. All operative cases were at Christ Hospital. Eight of the nine operated cases had a very marked tumor formation at the pylorus that could not but produce a decided obstruction to the passage of food; the one exception I have described in full under the heading of rumination.

Of the thirteen cases, nine were first-born and eleven were males. One was the fourth, one the third, and two were second children. Practically every case started out as a breast fed case, but a number of the mothers were advised to stop the breast feeding. The cases for which we still had a good supply of breast milk after operation far outstripped the others in rapidity and smoothness of convalescence. I cannot speak too strongly against the too frequent advice to "allow the breast to dry up" that is given by some doctors. The breast should be kept functioning even though other foods are being experimented with temporarily. In one case where secretion had practically ceased there seemed to be some secretion redeveloped after several doses of pituitrin.

In reviewing my histories I find I have marked, under the heading of "gastric wave," six cases as being triple positive; four as double positive; one as positive; one questionably positive, and the negative one is the case of rumination.

Under "palpable tumor" I have six cases marked as positive; five as questionably positive, including the one case of rumination; two were negative and these have not been operated though one may probably come to operation.

The average of the onset was twelve days, with five of the cases giving a history of some vomiting from birth; the oldest child was about six and a half weeks at the onset of symptoms. The average age at operation was fifty-two and a half days, with one hundred and sixty-five days the age of the oldest (case of rumination), and seven-

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teen days that of the youngest child. The average length of the period of symptoms of the operated cases was thirty-five days, with ninety-two days the greatest, and six the least. Seven of the nine operated cases lost an average of twenty-four ounces from the maximum weight, which is usually the birth weight, two cases gained ten and thirteen ounces before operation, but as these two cases were sixty-eight days and five and a half months old, respectively, this gain is relatively a great loss. These latter cases, long partially starved, are unusually poor risks. Of the three living cases not operated, one is apparently well several months after the last vomiting. One case is now a year old, weight  $18\frac{3}{4}$  pounds, but until six weeks ago had almost weekly attacks of vomiting lasting a day or so; one attack has occurred in the last six weeks. The third case, still under observation, eight weeks old, weighs fourteen ounces more than birth weight, it is vomiting daily after from two to all feedings, and has had gastric waves seen by Dr. Lamb, but on three visits I have failed to stimulate visible waves. The character of the vomiting and self-evident pain show there is some degree of obstruction to gastric drainage. This is the type of case where the best judgment is necessary to decide when to operate. It will probably be interesting to you to know these nine operated cases changed professional hands at an average of  $1\frac{3}{4}$  times before a diagnosis was made.

The average age of my eight living operated cases was seven and two-fifths months, at the time I last heard from them, and the average weight was seventeen and two-fifths pounds, or nearly one pound above the average given in Holt's book; this is in spite of the tremendous handicap of the first couple of months, and shows how very rapidly the gain is made if they have this opportunity given them. This work is the most satisfactory and pleasing work one can possibly imagine, even though the worries connected with it are quite acute for a few days. The surprised and intense pleasure of the parents when they see their first (usually) offspring begin to retain food, rest and sleep contentedly, pass digested milk stools, gain in weight, and in general lead normal baby lives, is most gratifying. Then, too, there is the real pleasure of saving a life that a few years ago might have been lost.

## GIANT DUODENUM\*

WITH REPORT OF A CASE IN A CHILD

BY WILLIAM A. DOWNES, M.D.

OF NEW YORK

CHRONIC dilatation of the duodenum without demonstrable pathologic changes either in the intestinal wall or surrounding tissues is observed not infrequently. This condition may be present in patients suffering from stomach, gall-bladder or pancreatic disease, or may result mechanically from peritoneal bands, or from pressure at the terminal portion of the duodenum in cases of general enteroptosis. However, in many instances a satisfactory explanation is lacking. The distention may involve not only the first or second portions of the duodenum, but may extend throughout its entire length. The gut wall is not thickened and may even be thinner than normal. This form of chronic duodenal dilatation is without characteristic symptoms or physical signs. Röntgen examination may be of assistance in making the diagnosis, but the findings are not constant and for this reason cannot be depended upon.

Contrasted to the above group of cases is the so-called giant duodenum—similar in nature to the well-known megacolon of Hirschsprung. Very few of these cases are mentioned in the literature. Corwin<sup>1</sup> in reporting a case in 1915 quoted W. J. Mayo as stating, that he had observed only one. Most of the reported cases have been in young adults. I can find no recorded instance of the disease occurring in a child. This condition presents a definite pathology as shown by extreme hypertrophy of the muscular structure of the intestinal wall, the symptoms and physical signs are characteristic and the röntgenologic findings positive. It is usually referred to as of congenital origin based on the assumption that the defect is in the intestine. However, it is much more probable that the gut is normal at birth, and that the distention and hypertrophy result from constriction at some point, usually the duodenojejunal junction. This constriction may be due to a congenital anomaly in the nature of a mesenteric band or to abnormal fixation of the terminal duodenum. It may also result from pathologic conditions, such as enlarged mesenteric glands or inflammatory adhesions.

The following case of giant duodenum came under my care at the Babies' Hospital.

B. W., male, aged four and one-half years. Admitted October 31, 1916, with a history of recurrent vomiting. Weight at birth 6 pounds—admission weight 29 pounds with clothes. Breast fed for five months. Vomiting almost from birth—at

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\* Read before The New York Surgical Society, April 11, 1917.

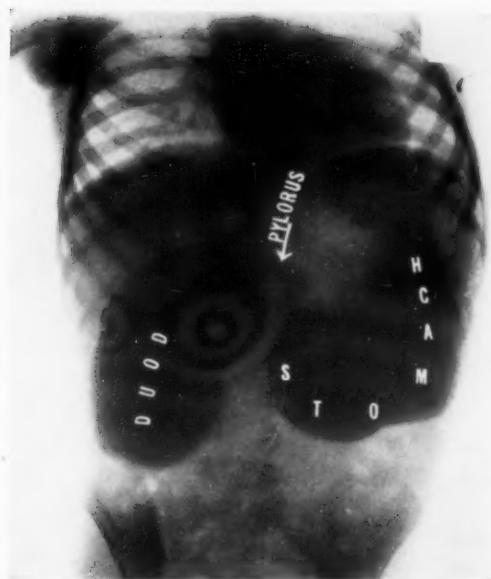


FIG. 1.—Note size of duodenum as compared with the stomach.



FIG. 2.—Stomach almost empty, duodenum even larger than the first picture. Note small amount of bismuth in jejunum.

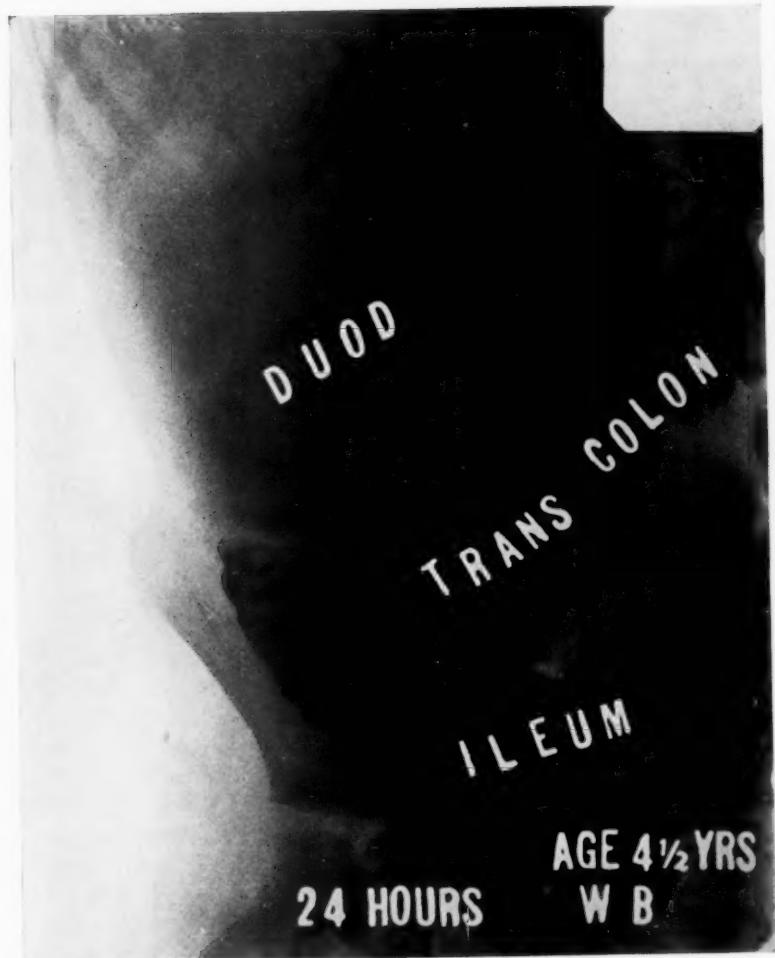


FIG. 3.—Duodenal pouch still distinctly outlined.

## GIANT DUODENUM

first very small quantities, later larger amounts. Periods of from one to two months without vomiting. As the feedings were changed from fluids to semisolids the vomiting attacks continued. Vomit frequently contained food taken from one to three days before; always hungry, and could eat immediately after vomiting. At four months of age had a severe attack of diarrhea with blood and mucus. Similar attacks about every two months. At eighteen months had an attack lasting three weeks, accompanied by high fever and extreme prostration. Last severe attack January, 1916. Marked constipation between diarrhoeal attacks. Stools foul smelling. Abdomen always distended, especially in epigastric region. Raised great deal of sour-smelling gas.

*Examination.*—Fairly well-developed, under-nourished child, very bright, color good, moderate distention. After taking 85 water marked peristaltic waves of unusual character were noted in upper abdomen. The movements of the stomach were not of a definite peristaltic character, traveling as do the ordinary cases of pyloric stenosis from left to right, but there was an irregular set of contractions visible sometimes near the cardiac and sometimes near the pyloric end of the stomach. In the region below the pylorus, to the right, there was a very definite peristaltic action—the waves passing from above downward and below upward, usually concentric in character. A large oval contracting mass could be felt in this region, and definite splashing sounds could easily be elicited. Percussion at this time gave a tympanitic note, although later on, when the pouch became filled with fluids, the note was flat. Lavage soon returned clear, to be followed later by bile-stained fluid with old food particles. No effort was made to distend the stomach or duodenum with air, as the X-ray had already given a clue to the diagnosis. Radiogram taken by Dr. R. D. Baker showed the following: Fifteen minutes after bismuth meal (Fig. 1) the stomach was seen to be in normal position and of about normal size. Just to the right of the stomach was shown a pouch, extending nearly in a vertical direction and fully the size of the stomach, which was apparently the dilated duodenum. In the second picture, taken two hours later (Fig. 2), the stomach had almost emptied itself, but the dilated duodenum remained about the same or was even larger, only a small amount of the bismuth had passed into the jejunum. Picture at twenty-four hours (Fig. 3) showed bismuth well into the colon, but the duodenal pouch could still be outlined distinctly. A study of these plates with the history and physical signs led to the diagnosis of partial obstruction of the duodenum, probably at the duodenojejunal junction, with saccular dilatation above. The patient was given daily lavage and small doses of atropine three times a day for one week.

*Operation* (November 6, 1916).—Posterior no-loop gastroenterostomy and closure of pylorus by silk ligature; upper

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right rectus incision. Stomach appeared normal with possibly a slight thickening of the wall; pylorus normal, easily admitted tip of index finger. Duodenum dilated to the size of the stomach. Wall smooth and three to four times thicker than normal. No diverticula observed. No adhesions or peritoneal bands. The distention involved the entire length of the duodenum, ending abruptly at the point where the gut passed under the superior mesenteric artery. No effort was made to determine the nature of the stenosis or its cause. The jejunum from its very beginning appeared normal in every way. No distention or hypertrophy. There were no adhesions in the region of the fossa of Treitz. No enlarged mesenteric glands. The usual posterior gastro-enterostomy was performed; double zero chromic catgut used throughout. Complete division of the pylorus was planned as a part of the original operation, but the condition of the child would not permit the carrying out of this step, and we were forced to resort to occlusion by means of a heavy silk ligature. Vomited moderately for twenty-four hours after operation, otherwise convalescence straightforward.

Discharged November 23. On mixed diet at this time, eating three meals a day. Condition very good. No distention and no fulness could be felt in region of duodenum. One week after discharge from hospital vomiting recurred—first in small quantities, but later in increasing amounts and at one time vomited as much as  $1\frac{1}{2}$  quarts. Distention returned and the general condition of the child became much the same as it had been before operation. Readmitted to the hospital December 6, almost in collapse, temperature subnormal and abdomen greatly distended. Lavage brought away a large quantity of undigested food with immediate improvement in the general condition.

Daily stomach washing and strict dieting failed to give more than temporary relief, the waves reappeared in the right upper quadrant, the temperature remained subnormal and the whole appearance of the child became distinctly worse. It was quite apparent that the pylorus had opened up. Since the improvement had been so marked for the first four weeks following temporary closure of the pylorus, complete division of this structure seemed to be indicated, and accordingly this was done on December 19. At this operation it was found that the ligature had cut partially through, and that there was free communication between the stomach and duodenum. The child did well for the first forty-eight hours following the second operation, then began to complain of pain in the epigastric region and at the same time a slowly forming mass could be felt in the right upper quadrant. This mass increased so that on the fourth day it occupied the entire right side of the abdomen. Temperature rose to  $104^{\circ}$ , and it was thought that peritonitis had developed. The distention in the right side was undoubtedly due to the fact that fluids and gas

## GIANT DUODENUM

were accumulating in the duodenum *via* the gastro-enterostomy opening, and it did not seem possible that the suture line could stand so great a strain. However, on the fifth day, after repeated enemata, gastric lavage and the use of pituitrin, the bowels began to move freely, large quantities of gas passed and the distention along with the mass disappeared. Convalescence from this time though slow was without incident. Discharged January 8, 1916.

For the first few weeks after returning home weight remained at a standstill, but more recently has begun to gain. Bowels move regularly, appetite good, and no return of vomiting attacks. Has had no distention nor have peristaltic waves been observed since he was discharged from the hospital.

*Discussion.*—The history of this case has been given in rather extended detail for the purpose of bringing out the symptoms, physical signs and Röntgen ray findings of an unusual condition. Also with the view of trying to determine whether or not the correct operative procedure was adopted. The symptoms and physical signs of importance were periodic attacks of vomiting, diarrhoea alternating with constipation, epigastric distention, and a peculiar form of peristaltic waves situated to the right of the median line running from above downward and below upward. Belching of large quantities of sour-smelling gas, and the return from the lavage which would at first be clear, to be followed later by partly digested food—known to have been taken days before—indicated the presence of a pouch-like formation either in the stomach or duodenum. Röntgen examination showed the contour of a normal stomach and an enormously dilated pouch, occupying the usual position of the duodenum, which left little doubt as to the diagnosis. Exact location of obstruction was the only point undetermined before operation.

Surgery offers the only possible means of relief in this class of cases, and the choice of operation lies between gastro-enterostomy with or without closure of the pylorus and duodenajejunostomy. Believing that gastro-enterostomy with resection of the pylorus would prove satisfactory in our case, the question as to the advisability of uniting the duodenum directly to the jejunum did not receive sufficient consideration either before or during the operation. As the stenosis was not of an inflammatory nature and had always permitted a certain amount of food to pass, it seemed that there would be sufficient room for the escape of biliary and pancreatic secretions, and that if the pouched duodenum was placed at rest it would very soon contract to its normal size. That this theory was more or less correct is borne out by the fact that until the ligature encircling the pylorus cut through the symptoms were relieved, and that since the pylorus was divided the child's condition has been satisfactory—barring the single attack of distention coming on

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forty-eight hours after the operation. I believe there would have been less likelihood of the duodenum giving trouble in the future, if instead of using the no-loop method, the anastomosis had been made about 15 inches from the duodenojejunial junction and enteros-anastomosis added. Gastro-enterostomy has been performed in many cases of chronic dilatation of the duodenum—very few of which were of the giant type—with only fair results. Improper selection of cases and failure to permanently exclude the pylorus may explain in part the unsatisfactory outcome.

Duodenojejunostomy is the logical operation for the relief of obstruction at the terminal portion of the duodenum. This operation was originally suggested by Bloodgood,<sup>2</sup> but the credit for first performing it belongs to A. L. Stavely.<sup>3</sup> In a personal communication of recent date Dr. Stavely<sup>4</sup> says that his patient, operated upon in 1908, was perfectly well when last heard from two years ago. I can find the record of only one other case operated on by this method, and that was by Dr. E. H. Beckman, of the Mayo Clinic,<sup>5</sup> in 1914. On opening the abdomen in this case a cystic tumor ten inches in diameter presented. The colon with the posterior layer of peritoneum was pushed forward. Examination disclosed an enormous duodenum extending from within two inches of the pylorus to the jejunum. The jejunum was somewhat dilated for a distance of three feet. Two fingers could be passed underneath the mesenteric vessels so that mechanical obstruction did not appear to be a factor. An entero-anastomosis was made between the distended duodenum and the jejunum, fourteen inches from its origin. There was a great deal of vomiting after the operation, the patient became very weak, and died on the sixth day. Autopsy showed a necrotic condition of a considerable portion of the jejunum which suggested that a thrombosis of some of the mesenteric vessels might have taken place. Some ten other cases have been observed at this clinic in which a distinct dilatation of the duodenum was found at operation, but this was the only one in which an operation was directly performed.

It is entirely too soon to pass final judgment on the outcome in our case. The end result may be all that could be desired, but after careful consideration of the subject from all points of view, I believe that duodenojejunostomy best meets the indications in the giant type of duodenal dilatation, and should have been adopted in the case herewith reported.

### REFERENCES

- <sup>1</sup> Corwin, R. W.: *Colorado Medicine*, May, 1915, vol. xii, p. 138.
- <sup>2</sup> Bloodgood, J. C.: *ANNALS OF SURGERY*, 1907, vol. xlvi, p. 736.
- <sup>3</sup> Stavely, A. L.: *Johns Hopkins Hospital Bulletin*, September, 1908, vol. xix, p. 252.
- <sup>4</sup> Stavely, A. L.: Personal communication, March, 1917.
- <sup>5</sup> Mayo, W. J.: Personal communication, March, 1917.

## MEGACOLON: MEGASIGMOID

HIRSCHSPRUNG'S DISEASE

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HIRSCHSPRUNG (1886) described a condition of "congenital high-grade dilatation of the colon, with thickening of all its tunics, especially the tunica muscularis, with retention of large quantities of fecal matter." The great dilatation may occupy the whole length of the colon, from the cæcum to the upper part of the rectum. One case was reported in which the dilated intestine and its contents weighed forty-seven pounds.

It is claimed by some that this condition is often acquired, due to the kinking of a long sigmoid loop which sinks low into the pelvis; patients with megasigmoid are always in danger of ileus. The congenital form is most frequent, and is seen very often in young boys, the sigmoid being most often involved. The usual symptoms are enlarged upper abdomen—the xiphoid-umbilical measurement is very much increased. Emaciation occurs from faulty nutrition and the whole outlines of the colon can be seen through the walls of the abdomen. Constipation is always most obstinate, and as it advances, there occur distention pains, which are relieved by repeated purgation and artificial emptying of the colon by copious enemata.

The treatment usually advised consists of frequent purgation, making an artificial anus and "short circuiting" the colon, also colectomy. The prognosis of this condition is grave in most cases with or without operation, but more recently the operative statistics have improved considerably. A case of this condition of the colon has recently been under my care, as follows:

Joe S., aged twenty-two years, male, white, laborer. Family history good. Had malaria when eighteen years of age. As a child was always having trouble with his abdomen—suffering pain more or less, and constipated all the time. During the past two years, he has had serious obstipation and great abdominal distention, especially in the upper abdomen (see Fig. 1). Strong purgatives and repeated copious stimulating enemata often failed to empty the colon. X-ray examination after ingestion of 4 ounces of barium sulphate was negative. The patient had no nausea or vomiting and did not suffer much pain. There was great distress from distention of the abdomen; this was aggravated by drinks and ingestion of food. Because of the frequent attacks and the long disability therefrom, it was decided that an exploratory incision be made.

W. R. JACKSON

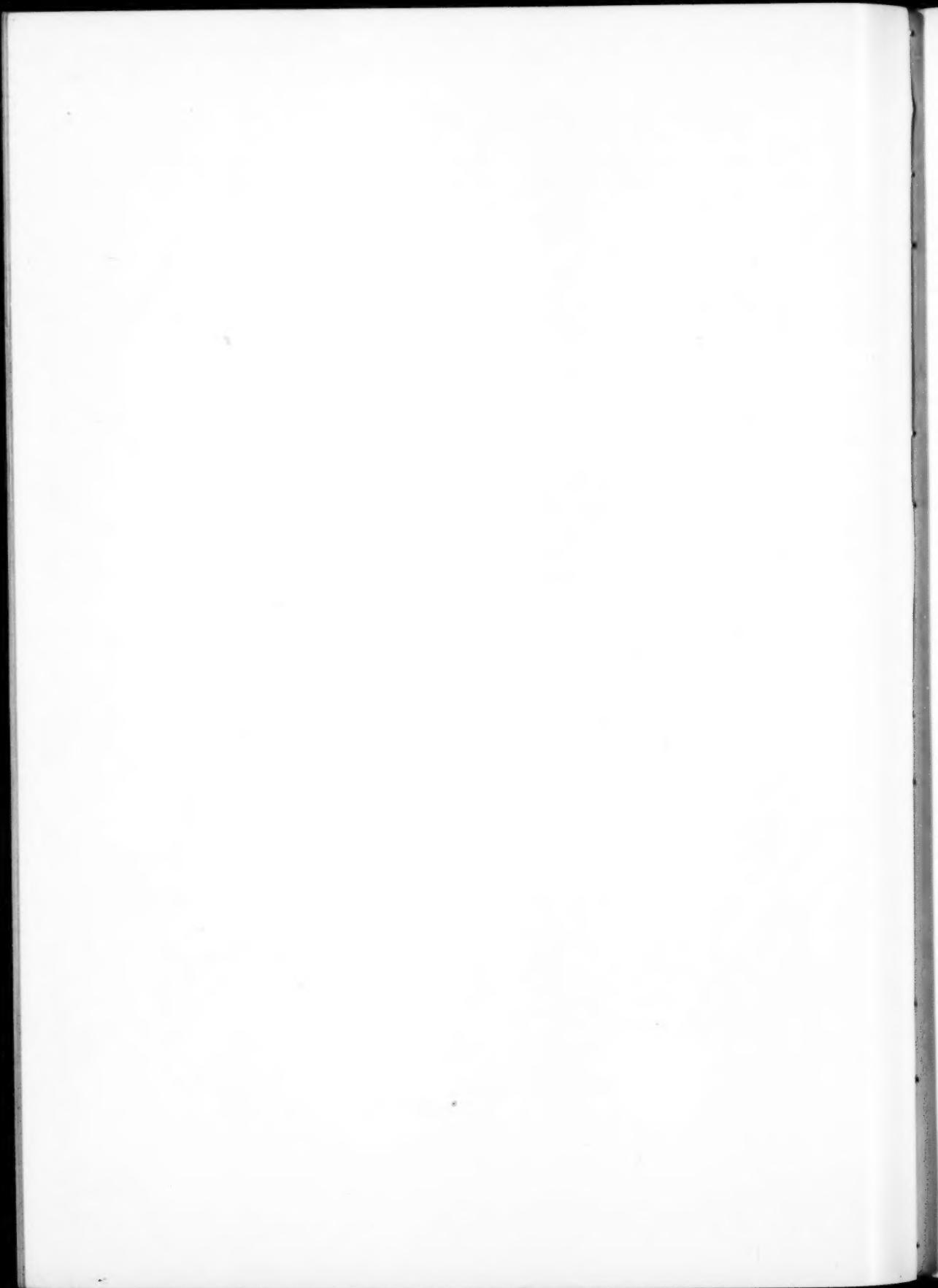
A long median incision was made, exposing all the intestines; the whole of the colon was moderately dilated and the sigmoid was sacculated its whole length; the sac was the shape of the stomach and measured 21 inches long and 18 inches in circumference, and was about half filled with fecal matter (Fig. 2). The walls of the sac were very thick and white in appearance. Excision of the whole sac or dilated segment was done between two clamps, and end-to-end anastomosis by suture made. The patient made an uninterrupted recovery, without any febrile disturbance. His condition at present, now two months since the operation, is good; his bowels move twice daily without purgatives; his weight has increased 15 pounds and there is no distention of the abdomen. His general condition is fine—his ruddy color has returned; his appetite and digestion are normal.



FIG. 1.—Megacolon (Hirschsprung).



FIG. 2.—Sigmoid (Hirschsprung).



## THE SAFE ELIMINATION OF THE COLON FOR THE RELIEF OF UNCONTROLLABLE INTESTINAL STASIS\*

BY ALBERT J. OCHSNER, M.D.

OF CHICAGO

AFTER eliminating the very large number of patients suffering from intestinal stasis who are primarily neurotics and suffer from intestinal stasis only secondarily, who are practically never benefited by surgical treatment, and the still larger number of cases suffering from intestinal stasis who can be permanently relieved from this condition by exercise, hygiene, dietetic and carefully planned, long-continued medical treatment, there still remains a very small class of cases, in our experience comprising less than 5 per cent. of all cases suffering from intestinal stasis, which constitute a third and distinct class whose members are not primarily neurotics and who are in so intractable a condition of intestinal stasis that they cannot obtain relief from non-surgical measures.

The members of the first class described above should not be subjected to surgical treatment because this treatment does them no good. Neither should this treatment be employed in members of the second class because they do not need it.

Surgical treatment should, consequently, be limited to the third class of cases described above, and these should be given the benefits of surgical treatment, provided this does not involve too much danger to life and insures permanent relief without troublesome complications. Most of the early methods employed failed in at least one of these respects, although the chief fault lay in the fact that these methods were applied very largely to patients belonging to groups one and two in the above classification.

The method first advocated by Lane,<sup>1</sup> consisting of a simple ileocolostomy, was especially unsatisfactory because of the tendency of fecal material backing up in the colon in a proximal direction from the enterostomy opening, filling the descending, the transverse, and even the ascending colon and sometimes the cæcum.

A partial closure of the sigmoid above the enterostomy opening frequently failed to relieve the condition. The plan suggested by W. J. Mayo<sup>2</sup> of excising the cæcum and ascending colon and preserving the descending colon proved satisfactory only in a small number of cases. The plan of excising the entire colon down to the sigmoid flexure, or including a portion of this, advocated by Lane and many of his followers in severe cases, increased the danger of the operation enormously, except in the hands of surgeons of very great skill. It also deprived the patient of the omentum. It would seem that the loss of this important organ should not be underestimated. In order to overcome this objection we employed a method,

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\* Read before the American Surgical Association, May 31, 1917.

with great satisfaction in a number of cases, in which we severed the ileum 20 cm. from its entrance into the cæcum, implanted the proximal end into the side of the lower end of the sigmoid flexure and brought out the distal end of the ileum through a small McBurney incision directly in front of the cæcum.<sup>3</sup> Through this opening the colon was carefully flushed, at first daily and later less frequently. This operation was fully as safe as the simple ileocolostomy, and had the advantage of enabling the patient absolutely to prevent the accumulation and stasis of faeces in the colon.

In cases in which the tendency for the accumulation of faeces seemed extreme, however, we have, during the past two years, in two cases, made use of an additional step which was suggested to me by Dr. William J. Gillette, of Toledo, Ohio, and which seems to contain more features than any one of the other methods we have employed. The illustration clearly shows all of the features of this operation.

The ileum is severed at the point which makes the anastomosis of its proximal end to the sigmoid flexure of the colon most convenient. The distal end is then carried out through a button-hole in the abdominal wall immediately in front of the cæcum, opposite McBurney's point, the fibres of the transversalis, internal oblique, and external oblique abdominal muscles being separated without being cut, in order that they may form a kind of sphincter to close the open end of the protruding intestine, which is held in position by means of a few fine silk sutures.

The sigmoid flexure of the colon is then severed at a point leaving the distal end in the best condition to make an anastomosis with the proximal end of the ileum.

In case an end-to-end anastomosis is made it is important to turn the two ends in such a position as to prevent having the mesentery of the ileum opposite that of the sigmoid, because of the danger of leakage at that point.

An end-to-side anastomosis of the ileum into the sigmoid is very satisfactory. In case both intestinal ends are closed in order to make a side-to-side anastomosis it is important to make the opening in the ileum near its distal end and to prevent the forming of a pouch or diverticulum beyond this point, as has been pointed out by N. M. Percy,<sup>4</sup> by attaching the very end of the stump of the ileum to the side of the sigmoid.

A fairly soft rubber tube 1 cm. in diameter should be carried up through the rectum and sigmoid beyond the anastomosis opening for a distance of 10 cm. into the ileum, as recommended by Lane, in order that there may be no accumulation of gas in the ileum proximal to the anastomosis opening, as shown in the illustration, and in order that normal salt solution may be introduced directly after completing the operation by means of the Murphy drip. The sphincter ani muscle should be dilated very gently, but very thoroughly in order to increase the comfort of the patient during convalescence.

The proximal end of the sigmoid flexure of the colon is then passed through an opening in the abdominal wall exactly opposite the opening on the

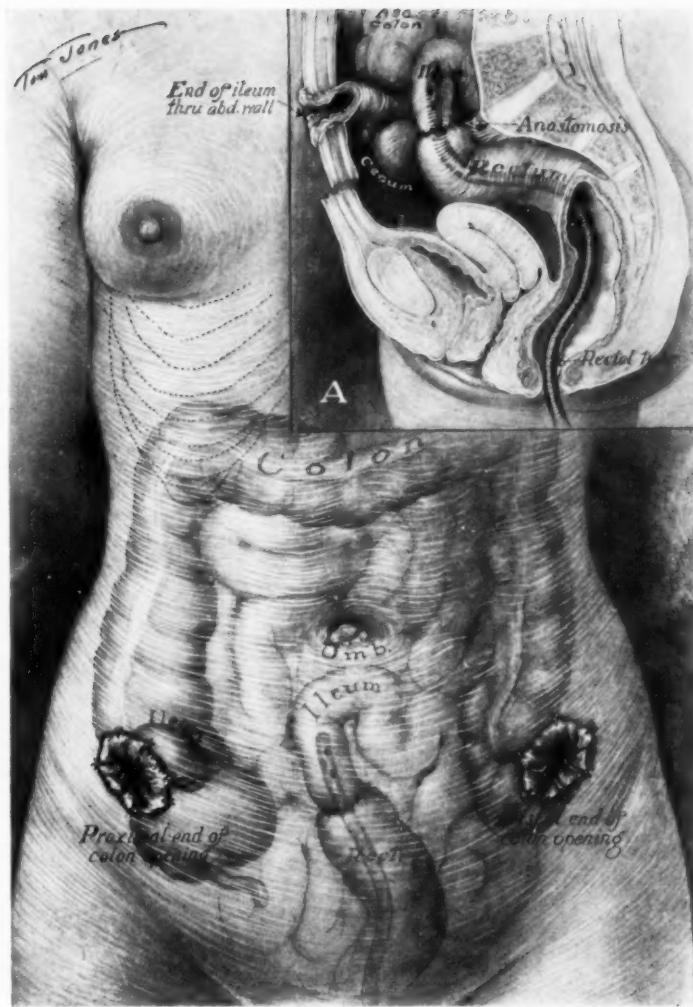


FIG. 1.



## ELIMINATION OF THE COLON

right side, through which the distal end of the ileum was passed during the first part of the operation. The end is permitted to project for a distance of 1 cm., and is fastened in place by means of a few fine silk sutures. This leaves the ascending, transverse, and descending colon and the omentum in their normal relations, able to protect the other intra-abdominal structures by their presence, while they are entirely eliminated so far as they can have any influence upon the causation of uncontrollable intestinal stasis. The slight amount of mucus which may accumulate in the colon can be washed out readily by inserting the nozzle of a syringe into the distal end of the ileum projecting through the abdominal wall. The condition causes the patient practically no annoyance, and is not offensive to himself or to others.

Since we have employed this method I have been anxious to try it in a case of Hirschsprung's disease, but so far I have not had an opportunity. It would surely reduce the danger of this operation in which the mortality, according to Picqué,<sup>5</sup> amounts to nearly 40 per cent.

The total number of cases in which surgical interference for the relief of intestinal stasis is indicated is so small that we have not had an opportunity to use this method in a sufficiently large number to justify conclusions, but it seems to possess a sufficient number of valuable qualities to make the method worthy of consideration.

The principle involved in this operation is, of course, the same that has been constantly in use in many operations upon the colon. A. E. Rockey<sup>6</sup> suggested appendicostomy in connection with Lane's operation for the same purpose.

## BIBLIOGRAPHY

- <sup>1</sup> Lane: Monograph on Intestinal Stasis.
- <sup>2</sup> Mayo, W. J.: Jour. Am. Med. Assn., August 8, 1914.
- <sup>3</sup> Ochsner, A. J.: Jour. Am. Med. Assn., August 12, 1916, p. 483.
- <sup>4</sup> Percy, N. M.: New Manual of Surgery, fourth edition, p. 327.
- <sup>5</sup> Picqué: Presse Médicale, January 15, 1913.
- <sup>6</sup> Rockey, A. E.: ANNALS OF SURGERY, May, 1911.

IDIOPATHIC CHOLEDOCHUS CYST  
WITH REPORT OF A CASE CURED BY CHOLEDOCHODUODENOSTOMY

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IN consideration of the rare nature of the disease and hoping to cast light upon its interesting pathogenesis, I should like to give an account of a case of severe cystic dilatation of the ductus choledochus, or, as it is designated in literature, idiopathic choledochus cyst, which was operated on by me last year.

The case is that of a ten-year-old girl, C. T., who was received into the county hospital of Lidköping on May 15, 1916.

*Remarks.*—No case of malformation in the family, no case of gall-stone, but, on the other hand, several cases of tuberculosis. The patient had whooping-cough and measles when two years old, and scarlatina in 1915, since which she has been delicate and weakly.

According to the statement of the mother, the patient ever since the age of three has had about once each year an attack of abdominal pains, sometimes accompanied by vomiting, usually lasting one or two days, during which time she was obliged to keep to her bed. Jaundice never showed itself during these attacks.

For three weeks before admission to the hospital the patient has occasionally had pains in the right side, but not so severe as to prevent her going to school. Three days ago, on the evening of May 12, the patient became ill with rather severe pains in the right side of the abdomen, repeated attacks of vomiting, but no shivering. The pains went through to the back, and were especially severe during deep respiration, but were somewhat alleviated when the patient assumed a half-sitting position. The following day, May 13, the patient felt better, the pains having diminished considerably. On May 14 the pains again became more severe with vomiting several times during the course of the day. The physician, who was called in, found there was fever and prescribed medicine. As the pains continued the following day, the patient was brought to the hospital. During her illness the patient has had normal stools on May 13 and May 15.

*Present Condition* (May 15, 1916).—The patient is of slight build, rather thin, the general condition somewhat depressed, complexion pale without icterus, the sclerae show, however, a slight icteric tinge. Temperature 38.1, pulse 100. Urine clear, dark-green, containing gall-pigments and a trace of albumen.

Heart and lungs, nothing to be remarked upon.

The abdomen, as a whole, sunken. In the right upper part of the abdomen, about in the middle, a slight protuberance appears

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in the wall of the abdomen about as large as half-a-crown. To palpation the above-named part corresponded to a tender resistance of about the size of a fist, oblong in form, with the long axis vertical, reaching downwards to the region of the umbilicus, and upwards to a finger's breadth below the costal margin, with a breadth from side to side of about 7 cm., lying in its greater part behind the right muscularis rectus, but protruding somewhat outside its outer edge. The tumor has a smooth surface and appears to be of rather firm consistency, but this is difficult to determine on account of the extreme tenderness. The tumor shows no respiratory mobility, does not permit displacement either from side to side or from above downwards; it does not give the impression of engaging the abdominal wall, nor does it appear to have any connection upwards with the liver, which as well as the gall-bladder is not palpable. The percussion tones over the tumor are somewhat shortened.

The patient had been sent in for supposed appendicitis. The palpable tumor might, if it had been situated somewhat further laterally, possibly be supposed to be caused by a retrocaecal abscess from an appendix, either unusually long, or situated abnormally high up, but the existing high and medial position seemed to put appendicitis quite out of the question, nor could the tumor be localized to any special organ as its origin. The preceding attacks of pain, as well as the existing slight icterus, might point to a cholelithiasis, although this disease is very rare in childhood, and the resistance could be explained as a hydrops vesicæ fellæ. The definite limit of the tumor upwards, without any connection with the liver, was against the theory of dilatation of the gall-bladder, further, its low degree of mobility and, in some measure, its form also. Opposed to the theory of the kidney as point of origin was the elevated and medial position of the tumor, as well as the absence of swelling in the flank. A cyst of the pancreas could scarcely be supposed, as they are very seldom lying so decidedly to the right of the medial line. It was not possible, therefore, to make a positive diagnosis, but it seemed to me quite evident that operative treatment was necessary.

An operation was performed the same evening under ether anaesthetic. A 10 cm. long vertical incision was made through the middle of the right rectus muscle from the costal margin to the level of the umbilicus, somewhat curved upwards towards the middle line. In the cavity of the abdomen an inconsiderable quantity of clear fluid. Nothing of note as regards appendix. The gall-bladder free and mobile, of normal size, with somewhat hyperæmic serosa. No stones to be felt. Below the gall-bladder lies the tumor which had been perceptible to the touch, in a retroperitoneal position, covered on its outer part by the transverse colon and the hepatic flexure and medially by the duodenum. It is of tense elastic consistency, in position and form corresponding in some degree to an enlarged kidney, so that my first thought was that it was a case of hydronephrosis. When better space had been

gained by a 5 cm. long transverse incision outwards from the middle of the abdominal cut, the peritoneum was divided laterally of the ascending colon and flexure which were pushed towards the middle and the tumor, evidently of a cystic nature, was exposed, by blunt dissection, first on its front side, where, however, its connection especially medially with the peritoneum was very intimate; in addition to this the difficulty of detaching it was increased by a rich development of veins. Downwards it was easy to get round the rounded lower pole of the tumor, as well as to pass upwards on its posterior side. It is found then that no connection exists with the kidney, which lies quite normal and free behind the tumor. The opinion is now in favor of puncturing the tumor, and while waiting till the puncture syringe is boiled, the tumor is raised upwards in order to examine more closely from behind its medial connection, especially with the pancreas, which, however, shows nothing abnormal in palpation. During these manipulations, the remarkably thin walls of the cyst burst and discharge its contents—dark-colored clear bile. This is absorbed in gauze, and amounts to about 200 c.c. The opening is widened upwards with scissors, so that the inside can be examined. The inside is pale, smooth, and of an equal surface with no perceptible alteration in the walls. No concrement can be discovered. It is evident that the sac consists of the highly cystically dilated choledochus; on account of its considerable depth it is impossible to see from the inside its connection with the upper gall-passages. When all the bile has been dried out of the sac, however, one could plainly perceive how the contents of the gall-bladder, on compression, emptied itself into the upper part of the sac. On examination of the continuation of the cyst downwards no continuous passage from the inside of the cyst could be discovered. After some searching, however, a small lumen was found, immediately to the left of the lower pole of the cyst, and this was found to belong to the upper end of the ductus choledochus lying behind the duodenum. An ordinary probe, inserted into this passage, went direct into the duodenum, without meeting any hindrance. The passage is 3 to 4 cm. in length and possibly somewhat narrower than a normal choledochus. Evidently the rupture of the cyst had occurred just at the junction between the cyst and the lower part of the choledochus. With a few catgut sutures the upper end of the stump is implanted in the cyst in its original position. As the position of the incision on the posterior side of the cyst was not suitable for anastomosis, it was sewed together with 2 rows of interrupted catgut sutures, after which an anastomotic opening 1.5 cm. long was made between the forward part of the cyst and the front side of the duodenum in the upper part of the pars descendens. The sutures were made in two rows, the outer one interrupted, the inner one continuous round about through the entire wall, both of catgut. The part where the choledochoduodenostomy was made as well as the suture line on the posterior side of the cyst and the part where the lower choledochus stump was

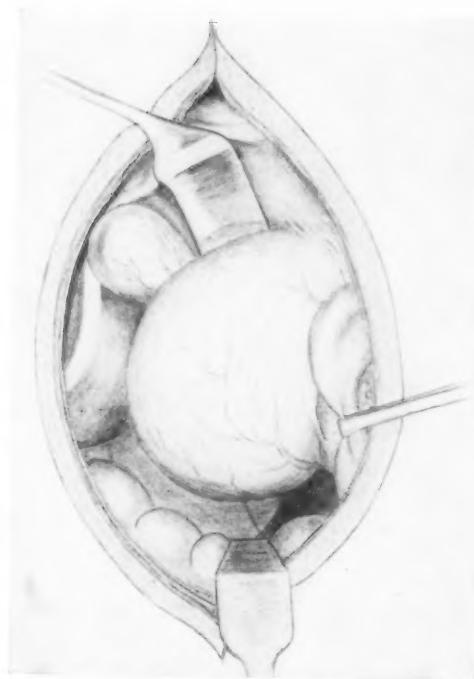
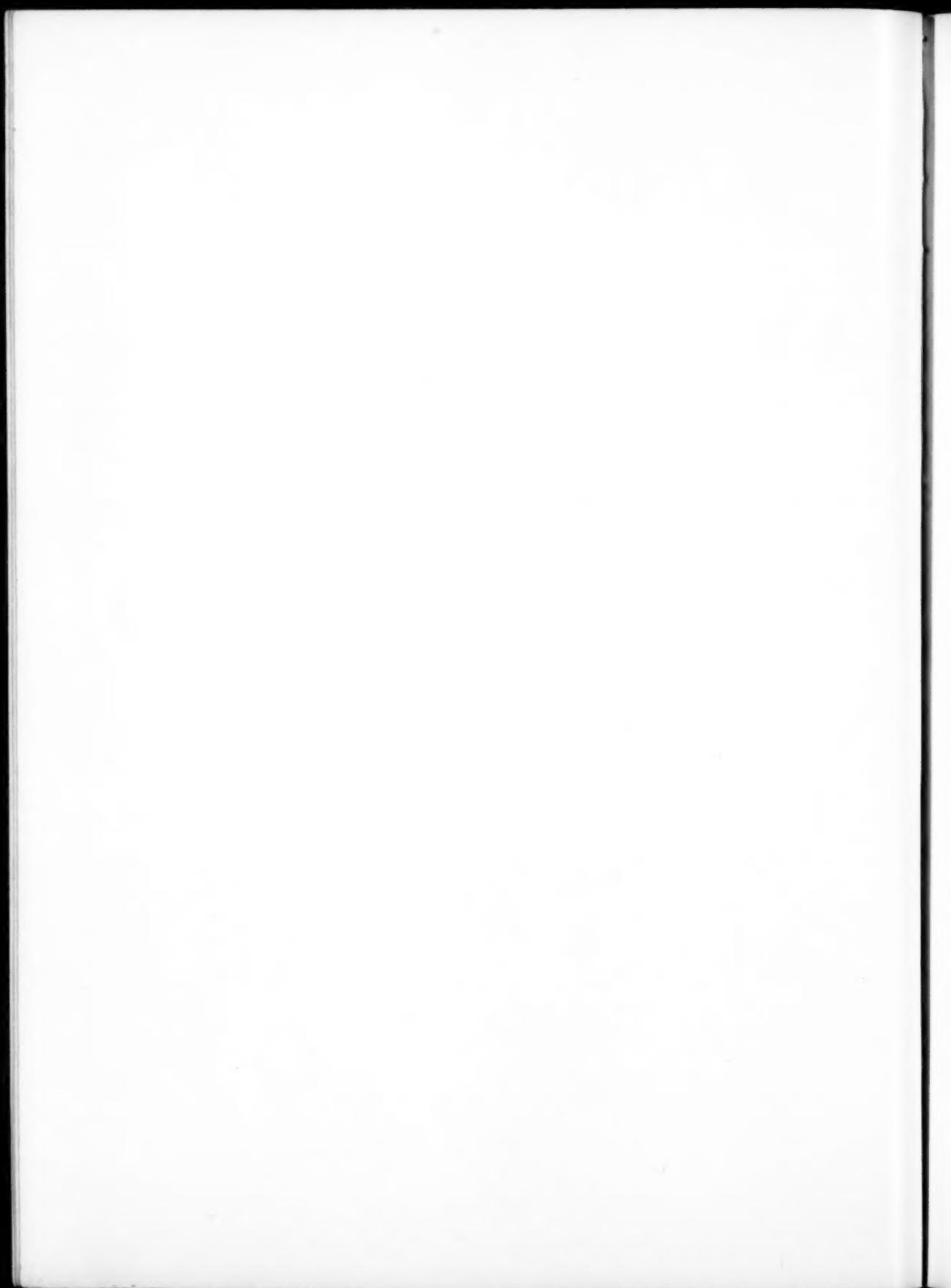


FIG. 1.—Cystic dilatation of the ductus choledochus.



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implanted were wrapped round with a wisp of the omentum. A small rubber tube was inserted against the outer part of the cyst, at a little distance from the place of the sutures, and was led out through the lateral angle of the transverse incision. The abdominal wound was then sewed up.

The patient was considerably exhausted after the operation, the pulse was feeble and extremely rapid; she revived quickly, however, after stimulants. Two days after the operation nothing could any longer be discerned of the above-mentioned trace of icterus in the scleræ, or the gall-pigment in the urine. During the first week after the operation there was a rising in the patient's temperature; this, however, went down afterwards. On the seventh day the drain-tube was removed, on the eighth the stitches. Healing by first intention took place. On May 29 the patient was allowed to be up. Twice, on June 4 and June 7, occurred an evening rise of temperature to  $40.3^{\circ}$  and  $39.2^{\circ}$  respectively, with vomiting, but no other symptoms. On both these occasions the temperature was normal the following day. On June 10 the patient was discharged, healed and well.

It appears from the observations made at the operation: (1) That the cyst (see accompanying drawing, Fig. 1) was developed from the middle and upper part of the choledochus; (2) that the lowest portion of the choledochus, 3 to 4 cm. in length, was not engaged in the dilatation; (3) that the above-mentioned part of the gall-passage, representing the communication between the cyst and the duodenum, did not show obstruction, and (4) that none of the otherwise usual obstacles to the passage of bile into the choledochus, in the form of stone, tumor, stricture, or pancreatitis, were found to exist. These circumstances exclude the presumption that this was a retention cyst in the ordinary sense; the case must be explained as one of idiopathic dilatation, a so-called real choledochus cyst, corresponding in all its details with all others of analogous type.

Previous to the operation this disease was unknown to me, and I was thereby led to an examination of the literature on the subject, the result of which seems to cast light upon the disease in question.

When Langenbuch in 1897 published his great work on the surgery of the gall-passages, he only knew of one case, that of Konitzky in 1888. In 1909 Ebner gave a summary of 11 new cases, described by Douglas, Edgeworth, Seyffert, Heid, Russell, Nicolaysen, Rostowzew, Dreesmann, Broca and Bakes, as well as a case of his own, operated on by Lexer. Schloessmann in 1911 reports 4 more cases—Wettwer's, Arnold's, Weiss's and one operated on by Sprengel. From Japan, in the following year, Mayesima gave a new observation of the disease. Kehr, in his last great work, *Neue Deutsche Chirurgie*, 1913, mentions 2 more cases, Letulle's and Goldammer's, and finally, 1916, Seeliger in a summary of the preceding cases, reports still another new case which he observed in 1913. Besides these cases, 20 in all, I have been able to

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discover no less than 14 others, reported by Arnison, Butters, Twain, Ebner, Sternberg, Clairmont, Brun-Hartmann, Ashby, Kolb, Lavenson, Hildebrand, Ipsen, Smit and Heiliger. The sum total therefore of known cases, my own included, would be thirty-five. Common to all these cases is the circumstance that the disease could not be diagnosed clinically, in most of the cases, not even at the operation. For this reason and on account of an irrational method of operation most cases have terminated fatally; only a few having been restored to health by the operation. Among the latter I find only one case, that of Bakes, in which, as in the case operated on by me, an anastomosis was made primarily between the cyst and the intestine.

The idiopathic choledochus cyst, says Konjetzny, who has closely investigated the disease from the pathological anatomical point of view, is dependent upon a congenital anomaly in the course of the common duct. It differs distinctly from the not uncommon dilatations of the choledochus, which appears as a secondary circumstance in previous diseases of the gall-passage or pancreas as a result of the purely mechanical obstacles these diseases produce. The dilatation of the gall-passage in question includes, as a rule, the gall-duct in its entirety, converting it into a uniform cylindrical tube, retaining its original form, and never—even when of year-long standing—exceeding a certain degree of dilatation, corresponding about to the thickness of the small intestine—while the circumstances in the case of a choledochus cyst are quite different. It is here a question of what one might call independent primary enlargement of the common duct, only engaging its upper and middle portion, with free passage of its lower undilated part, forming a spherical or ovoid sac-like enlargement, a sort of “biliary cloaca” (Letulle), generally of very considerable size. Thus, in most cases, the dimension of the cyst has been about that of a child's or a man's head, in some instances, the quantity of fluid it has been capable of containing was as much as 4 or 5 litres. In my case the cyst was remarkably small, in comparison to the other cases. I estimated it as about the size of a fist, a volume which seems to be rather exceptional. The position of the cyst is below the liver, usually lying closely pressed against its lower surface. Sometimes, as in my case, when it had not advanced so far in its size, it lies a little below the liver. It often extends over the middle line, and goes backwards towards the spinal column, more or less further downwards, in not a few cases as far as the pelvis. It generally adheres firmly to the surroundings. The duodenum is forced more or less medially, to a degree corresponding to the size of the cyst. In one case, Seeliger's, it was pressed quite flat against the front cyst wall; the stomach is pushed over to the left, and not seldom turned on edge with the great curvature forward. The right part of the transverse colon and the hepatic flexure are pushed to the left and downwards. The upper part of the gall system, including the gall-bladder, shows

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either no dilatation or a very inconsiderable one in proportion to the choledochus. The liver, in the far advanced cases, has, when enlarged, exhibited the appearance of a biliary cirrhosis. As already mentioned, the lower, more fixed portion of the choledochus, lying behind the duodenum, is never affected by dilatation, and long retains its normal calibre. For the explanation of the manner of origin of the cysts, the minute examination of the condition of this part of the choledochus has been of great importance. It has been found several times that the end portion has undergone a development deviating from the normal, with a more or less oblique opening into the intestine in a direction from left to right, or from the front backwards, instead of the normal direction from right to left. A more or less marked kink has been thus produced, and this has been explained as an obstruction of the passage of congenital origin, causing the dilatation of the passage lying above. In my case, no such abnormal insertion in the duodenum could be found, and besides, it is difficult to think that this alone could be the real cause of the dilatation, when in all cases, signs of difficulty in evacuation have been existent only for a relatively short time, while the choledochus, to judge from the reports of the illnesses, has performed its function normally for years previously. Another circumstance which might be of greater significance is that in most of the operated cases a more or less sharp transition has been found to exist between the cyst itself and the upper part of the end portion. From the fact that the enlargement took place to the right and downwards, the developed diverticulum has been pressed with its left wall against the fixed end portion of the choledochus, compressing the latter, so that on cutting open the cyst, it actually looked as if this part of the choledochus lay like a fine canal in the medial cyst wall itself. Inside the sac, it had the appearance of a valviform duplication of the wall, and this valve has during life acted as a ventile with intermittent action. This circumstance would be, therefore, to a certain degree, analogous with hydronephrosis, produced by an obliquely inserting ureter or with a kink in the cystic duct, with transformed gall-bladder the so-called cholezystosis remittens. In the case operated on by me the existence of such a fold could unfortunately not be ascertained in consequence of the rupture of the tumor which occurred just at the point in question; but in view of the fact that the dilatation took place so far down that the lower pole of the cyst lay below the pars horizontalis inferior duodeni, consequently below the place of entry of the common duct into the intestine, I should consider it most probable that such was the case. The mechanism of the emptying of the cyst would then be as follows: With a certain fulness of the sac the fold is pressed close to the opposite wall, rendering emptying for the time impossible; by a continuous supply of bile from the liver, however, the pressure inside the sac is continuously increased, the cyst wall expands more and more, the effect of which will be that the spur-like fold of the mucous

membrane at the place of the kink is gradually pressed somewhat to the side, leaving a portion of the lumen free, and permitting the discharge of a quantity of bile into the duodenum. The pressure now relaxes again somewhat in the sac, and the wall contracts and forms a valve again; this hinders a further discharge and prevents the cyst from becoming completely empty. In many cases which have been sufficiently long under observation (Rostowzew's, Heid's, Wettwer's, Smit's) the working of this intermittent valve-mechanism has been clinically observed, showing itself in a peculiar and striking increase and diminution of the tumor with respectively increased and reduced tension or consistency and tenderness of the same, and it has in reality given the clinical picture of the disease a very characteristic feature. It may be mentioned in parenthesis that, in some cases, a similar valve or fold formation has been found, not only at the junction of the cyst with the end portion of the choledochus, but also farther up at its union with the cysticus and even with the hepaticus.

The above-described valve formation gives a sufficient explanation of the question, why the fully formed cyst cannot empty itself, and why it undergoes an ever-increasing enlargement of volume. But it is impossible to suppose that the valve can be developed until a part of the duct has been widened into a sac-like cavity and the existence of the valve is therefore not sufficient to explain what causes the first enlargement. Many hypotheses have been put forward for the explanation of this primary dilatation, which later leads to valve-formation and ventile obstruction. It has been supposed that there exists congenital weakness of the wall, with defective development of the elastic and muscular elements, a sort of atony, as predisposing circumstance, and, as immediate cause, a catarrhal mucous swelling, a stone, or spasmodic contraction of the choledochus sphincter. Further, Dreessmann has suggested the idea of a congenital primary dilatation of the passage. Kehr also mentions this, but says at the same time that proof of this possibility is, up to the present, absent from literature. It seems to me, however, that such proof really does exist, although not mentioned in any of the accounts published of operatively treated choledochus cysts, not even in Seeliger's of the last year. It is to be found related by Heiliger in 1910 in a dissertation from the Women's Hospital in Giessen. In postmortem examination of an almost mature male foetus, he happened to find, besides a diaphragmatic hernia (containing stomach, spleen and small intestine) also an alteration in the choledochus in the form of a 3 cm. wide, 2½ cm. long, tense, cyst-like distention of the same. He says, "through this sac-like distention of the choledochus, exclusively confined to its distal portion, which, in relation to the normal, must be regarded as a monstrous enlargement, and which only in a slight degree passes into the orifice of the hepatic and cystic ducts, the proximal end of the choledochus, which had its course in the wall of the choledochus sac, was compressed to such a degree that it was

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only after some trouble and by means of a fine bristle that it was possible to probe this part. It must, however, be supposed that sufficient bile had come out into the intestine, for the intestinal contents were normally bile-colored, and there was not a single sign of bile stagnation, nor any icteric coloring of the tissues."

This observation of Heiliger's seems to me to give indisputable proof that the choledochus cyst itself can exist already formed at birth, that it can be really congenital. But from the fact of its existing from birth it does not necessarily follow that it should show immediate symptoms. On the contrary, all observations seem to indicate that it is in the beginning absolutely latent to its owner. This period of latency then, as appears from the accounts of the disease, can evidently, in different cases, vary very considerably, and as the cyst evidently has a marked tendency to develop continuously in size, it seems to be the natural conclusion that what determines the point of time when the first symptoms of the disease begin is the size of the fetal choledochus sac. If this, at the time of birth, has already attained large dimensions, the troublesome symptoms it produces come earlier than if the individual is born with a smaller cyst. The youngest of the patients observed with serious symptoms of the disease was 2 years old, the oldest 25—between these two ages lie all stages. The average age when the patient began to suffer from the disease seemed to have been from 12 to 14.

The principal *symptoms* produced by choledochus cyst are icterus, tumor and pains. The icterus has been intermittent and, in a number of cases, has passed into a continuous form of varying severity; in nearly all cases it has been remarkably strongly marked, in a couple to a very high degree—icterus melas. Only in one case, Smit's, it has been completely absent; in my case it existed only in subicteric coloring in the scleræ and urine. The most important symptom is, without doubt, the tumor, lying in the right hypochondriac region and almost always attaining a very considerable size. In none of the published cases was it of so small dimensions as in mine, where it was of the size of a fist. In several cases it has been as large as a child's or a man's head, or even larger. As a rule, it is situated immediately close to the liver, in certain stages, as in my case, it is clearly separated from it by a region with tympanitic percussion tones. In 5 of the published cases (Dreesmann's, Mayesima's, Arnold's, Seeliger's and Russell's) could be observed over the great tumor another smaller one, varying from the size of a hen egg to that of a goose egg, lying under the edge of the ribs, and having its origin in the equally palpable, somewhat distended gall-bladder. In the cases which have been observed long enough, the great tumor, as I have already mentioned, exhibited a peculiar variation in size and consistency, and this variation has been ascertained to result from the taking of food into the stomach; the tumor swells and becomes harder some hours after meal times, evidently in connection with the fact that the secretion of bile is most active at this time. The pains have varied

from more or less severe flatulency of the abdomen to the most violent colic pains. Their violence is usually in proportion to the icterus and the size of the tumor. These symptoms have generally been accompanied by fever, and the general condition has been more or less affected. Three times (in Ashby's, Mayesima's and Wettwer's cases) ascites has occurred, caused by the compression of the portal vein by the tumor. Further, the disease has generally developed at intervals spread over a varying period of time, and as a rule, finally showing very evident symptoms; once (Seeliger's case) exhibiting a real intestinal obstruction. A peculiarity of this disease is that it appears par préférence in the female sex; only in 5 of the known cases (Russell's, Weiss's, Mayesima's, Clairmont's and Butters') has it attacked boys. No one has given a satisfactory explanation of this very remarkable fact.

As regards to the *diagnosis* of the disease, this, as has been already mentioned, has hitherto not once been possible previous to operation. It has usually been mistaken for an echinococcus, pancreas or liver cyst. It seems, however, that if one is only acquainted with the fact of the existence of such a disease it would not be impossible to recognize it. Its appearance during the first two decades, as a rule, usually among females, with repeated attacks in the form of a large, cystic, sometimes in size alternating swelling in the right hypochondriac region, more fixed than a distended gall-bladder, conjoined generally with icterus, fever, more or less violent pains; these features, says Dreesmann, are so characteristic that a diagnosis of probability of choledochus cyst would be authorized.

With regard to the *therapeutics* of this disease, an investigation of the 30 cases in which operative measures were employed shows the following: In the majority of cases, namely in 21, the operative treatment consisted only in suturing the cyst in the abdominal wound and the application of an external fistula, in some cases after a preceding puncture through the abdominal wall. All these cases ended fatally a longer or shorter time after the operation, either from exhaustion caused by the enormous loss of bile through the fistula or on account of subsequent icteric hemorrhage or infection. In 1 case, however (Clairmont's), the patient lived three years with this fistula, and died of phthisis. In Ebner's case death occurred in the remarkable form of purpura hæmorrhagica fulminans three months after operation. In 3 of the 21 choledochostomy cases (Ashby's, Dreesmann's and Seeliger's) an attempt was made by means of a second operation to establish communication between the cyst and the intestine; death, however, resulted in all cases. In 1 case, operated on by Bakes, 1911, as well as anastomosis between the cyst and duodenum, a fistula at the same time was made externally, either on the choledochus or the gall-bladder (which does not clearly appear from the account given by the pathologist, Sternberg, who made the postmortem examination); this patient also sank from the operation. In 3 instances (Goldammer's, Lavenson's, and Smit's) the operation

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consisted in extirpation of the sac. Death ensued after the operation in these cases also. There remain 5 cases which were restored to health. In 3 of these cases an external fistula was made primarily, and communication between the cyst and the intestine was opened secondarily. In the first of these cases, operated on by Twain in 1894, the anastomosis was made with Murphy's button to a loop at the jejunum drawn up through an opening in the mesocolon. In the second, operated on by Brun and Hartmann in 1897, after a previous marsupialization of the cyst, choledoco-enterostomy was performed in a manner not fully described. The third, operated on by Hildebrand in 1912, was so far remarkable in that the anastomosis made between the cyst and the duodenum could not produce healing of the external fistula, evidently depending on the fact that it was of insufficient size; only when, in a third operation, a new larger inner fistula opening was made did the outward flow of bile cease and definite healing take place.

In the 2 other cases, that operated on by Bakes, 1907, the other my own case, has, as primary measure, a lateral choledochoduodenostomy been made, and both were restored to health.

Bakes' case was examined two years after operation, and the patient was then in perfect health. My case occurred only ten months ago, but from what I have learned the patient has been well ever since the operation.

It appears, therefore, from what has been said, that the opening of communication between the cyst and the intestine is the only rational therapeutic, and this ought to be done primarily.

Dreesmann feared that the application directly of connection between the intestine and the cyst would cause infection of the latter by intestinal bacteria and lead to progressive cholangitis and hepatic suppuration; he proposed, therefore, in order to reduce the risk of infection, which he feared, that the operation should be performed in successive stages; first by employing a gastro-enterostomy; two or three weeks later exclusion of the pylorus according to von Eiselberg, and then making use of choledochoduodenostomy. Well thought out theoretically, this is not, however, to be recommended; partly because the patient is, as a rule, in a reduced icteric condition, which does not permit several trying operative encroachments, partly because, judging from the experience gained from several quarters, the danger of infection from anastomoses between the biliary passages and the alimentary canal is practically not so great.

Finally is hereby given a survey of the cases of idiopathic choledochus cyst described in literature, with short extracts from the descriptions of the cases.

### A. OPERATED CASES.

1. KONITZY, 1888. A woman of twenty-one. Ill six months. Rapidly increasing fluctuating tumor, extending from the liver to crista il. Icterus. Operation. Extreme cystic dilatation of choledochus sac, which was incised. Died eight days after operation.

2. SEYFFERT, 1888. Woman of twenty-three. Suffered from icterus for two

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years, with intervals of four months, for one year, increasing swelling of the abdomen and attacks of colic. Beside the gall-bladder, which was normal, a tumor as large as a child's head, which proved to be a gall-filled cyst. Drinage. Patient died one month later of violent hemorrhage, which could not be stopped.

3. ARNISON, 1891. The tumor was supposed in operation to be a pancreas cyst and was drained. The patient, who was very much exhausted, lived only a few days. In the postmortem the operation was found to have been choledochostomy and the tumor the dilated common duct.

4. SWAIN, 1895. A girl of seventeen. Had been ill two years. Increasing icterus and swelling of the abdomen for ten months. An enormous abdominal tumor filling the whole of the right side, and extending even to the left half of the abdomen. Puncture, discharge of six pints of a gall-colored fluid. Tumor formed again after five days. Operation. The cystic tumor was emptied of seven pints of gall-colored fluid. The gall-bladder was normal, and lay above the tumor. Gall-stone, at first supposed to exist, could not be found. Anastomosis between the cyst and jejunum with Murphy's button through mesocolon transversum. Recovery.

5. EDGEWORTH, 1895. A girl of four. Ill one year. Repeated attacks of icterus. Large abdominal tumor, diagnosed as distended gall-bladder, which was drained. Death one week after operation. The sac was found to be the enormously distended choledochus, stenosed at its lower end. Cystic duct obliterated.

6. BRUN-HARTMANN, 1897. A girl of three and one-half years with congenital dilatation of the choledochus. The cyst was first marsupialized by Brun. At the next operation Hartmann performed choledoco-enterostomy with success.

7. RUSSELL, 1897. A boy of eight years. Acutely ill for five days with fever and icterus. Right flank filled by a large distended tender tumor, extending downwards to the crista il., forward to the middle line. Under the ribs another tumor, as large as a hen egg, insensitive, and not quite so distended. Diagnosis, echinococcus. Operation: Choledochostomy. Died four days after the operation of hemorrhage from the stitches, according to the account given. Postmortem showed that the cyst came from the choledochus and that the passage between this and the intestine was free. Russell regarded the formation as congenital and analogous with congenital hydronephrosis.

8. ASHBY, 1898. Girl of seven years. Ill two and one-half years with icterus, and increasing emaciation and finally swelling of the abdomen and œdema in the legs. After fifty ounces of ascites fluid had been tapped from the abdomen, a large cyst was observed in the right half of the abdomen; during a period of three months this was punctured eleven times and from eight to sixteen pints of gall-colored fluid drawn off each time. When the patient began to improve under this treatment a choledochostomy opening was made through which all the bile was drawn off. Two months later, an attempt was made to establish connection between the cyst and the intestine. Death from peritonitis ensued. "The cyst seemed to be formed by enormous distention of the common and cystic ducts. The hepatic duct opened into the cavity, but there was no connection between it and the duodenum."

9. ROSTOWZEN, 1898. A girl of thirteen years. For three years distention of the abdomen. Intermittent icterus for one year. Large tumor in the region of the liver, fluctuating in circumference and consistency. Temperature rising to 39°. The cyst which was firmly adherent to its surroundings was first emptied by puncture of two litres dark greenish brown fluid, then sewed fast to the wall of the abdomen and drained. Death the day after operation. Postmortem showed an enormous enlargement of the choledochus, the hepaticus also dilated. The cyst exhibited a kind of valve, and, like the gall-bladder, was empty. The choledochus was bent at an angle at the entrance into the duodenum, and passed obliquely through the front wall.

10. NICOLAYSEN, 1899. A girl of eight years. Icterus a year previously for three months. At her reception into Rig's Hospital in Christiania the patient showed a high degree of icterus, acholic stools, and a fluctuating resistance in the right side under the liver, seemingly as large as a man's head. A small incision was made in

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the abdominal wall, with packing against the cyst in order to get cohesions forward. Six days later the cyst was opened and emptied of one and one-half litre of gall-colored fluid. Death ensued the following morning. The postmortem showed that the cyst had originated through enlargement of the hepatic duct and the greater part of the choledochus, the lower portion of which, to a length of two cm., which was fully permeable, was not engaged in the dilatation. The gall-bladder small, and communicating freely with the cyst. "As concrements were not found anywhere, nor disease in any of the adjacent organs, one cannot suppose compression or obstruction of the common duct or the hepatic duct to be the cause; the smallness of the cystic duct being also opposed to this idea. The solidity and thickness of the cyst are also in favor of the theory that enlargement may have been taking place for a long time, perhaps even from birth."

11. DREESMANN. Woman of twenty-four years. Even as early as at the age of six months the patient had been yellow for a short period. Since the age of three violent attacks, with vomiting. From the age of eighteen the abdomen had been very much distended. For two months severe icterus with fever. Below the liver, a swelling as large as a man's head, tender to the touch, and, distinct from this under the edge of the ribs, a fluctuating tumor as large as a fist. The distended gall-bladder, and the large cyst were both opened and drained. An abundant flow of bile up to 1800 cubic cm. daily. Four and one-half months later, an attempt was made to form a connection between the cyst and the duodenum. Sudden collapse of patient three days later. The postmortem showed the absence of peritonitis. The swelling was the enormously dilated choledochus, and the dilatation was continued up into the upper gall-passages. The lower part of the choledochus to a length of three cm. was not engaged in the dilatation and was easily probed, partly from the cyst, and partly from the papillæ vateri.

12. KOLB, 1905. A girl of ten years. For some months, distention of the abdomen and icterus. Below the enlarged liver a distended elastic fluctuating tumor extending downwards to the smaller pelvis, and to the left to the left mammillary line. Test puncture exhibited a gall-colored fluid, without echinococcus hooks. A fortnight later operation (6-Angerer). After tapping the enormous cyst of one and one-half litre, it was sewed to the abdominal wall and drained. Death ensued, not quite a month later. Postmortem showed a cystic tumor into which the upper gall-passages opened upwards. The connection of the cyst with the intestine was only found on microscopic examination and was situated somewhat to the side of the pancreatic duct.

13. ARNOLDS, 1906. A girl of thirteen years. Distention of the abdomen for two years. Signs of obstruction of the choledochus for seven months. During the last few weeks, strength greatly reduced. Below the enlarged, strongly lobed liver in the middle of the abdomen a distended elastic tumor as large as a man's head; to the right of this another smaller cyst. In laparotomy the right cyst proved to be the enlarged gall-bladder, the left the dilated choledochus, from which was discharged "half a bucket full" of gall-colored fluid. Death ensued after twenty-four hours. In postmortem access could easily be obtained to two passages as wide as the forefinger from the upper pole of the cyst. These were the dilated hepatic ducts. Downwards, connection with the duodenum was found in a short passage with a double angle bend.

14. GOLDAMMER, 1906. A woman of twenty-one years. Had undergone parturition three months previous to her entering the hospital. During pregnancy no troublesome symptoms, but after confinement a swelling observed under the edge of the ribs on the right side, and increasing icterus made its appearance. In the upper part of the abdomen a fluctuating non-sensitive tumor about the size of a child's head and connected with the liver. Icterus in high degree. Operation (Rümmel). Extirpation of the cyst, which contained several litres of greenish-brown serous fluid. Death from collapse. Postmortem showed complete absence of the choledochus with the exception of its intraduodenal portion, and the cyst must therefore

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have been the enormously dilated common duct. The gall-bladder was unaltered. The cut-off hepaticus branches at their entrance into the liver were about the size of the forefinger. The intrahepatic gall-passages were much enlarged. No cause of the choledochus dilatation could be established.

15. BAKES, 1906. A woman of twenty-two years. Had suffered for three months from icterus without any other symptoms, except increasing loss of strength. Beside an icterus melas, with acholic stools, only a certain tenderness below the right edge of the ribs could be observed clinically. At operation a rounded cystic tumor as large as a child's head was found between the ventricle and the liver. Above the lower pale of this growth lay the duodenum in a strongly forward displacement. Gall-bladder normal. Papilla duodeni felt normal, without tumor or stone. It was supposed to be pancreas-mesenterial or kidney cyst. Test puncture gave thin yellow bile. Incision of the cyst, probing from the same to the intestine failed. Choledocho-duodenostomy was performed and the patient recovered.

16. EBNER, 1909. A girl of eighteen years. At the age of nine temporary attack of gall colic. From the age of thirteen almost constant painful sensations in the region of the liver, with gradually increasing swelling there. Icterus for six months. Clinically a district of resistance of the size of a man's head in the right hypochondriac region, of distended elastic consistency. Operation (Leerer) showed a cyst lying spread out under the surface of the liver, and filled with thin fluid gall. The cyst had developed retroperitoneally in bursa omentalis. Was sewn to the abdominal wall and drained. Gall fistula. Lived three months in comparative health. At the end of this time an extremely violent purpura hæmorrhagica developed in a few days producing death. Postmortem showed an enlargement of the choledochus, of the size of a man's head, as well as dilatation of the duct hepaticus and orifice of duct cysticus. Remainder of cysticus as well as gall-bladder normal. The lowest undilated portion of the choledochus pierced the anterior wall in an oblique direction, and when probed showed a completely free passage.

17. LAVENSON, 1909. A girl of eight. Icterus one year. For three weeks a swelling in the upper part of the abdomen. Clinical examination showed a considerable cystic non-sensitive tumor in the upper part of the abdomen, attached to the liver, and extending somewhat below and to the right of the umbilicus, as well as a high degree of icterus, and discolored faeces. Operation (Frazier) a cyst as large as an ostrich egg, covered in its lower part by the duodenum, between the latter and the liver the somewhat distended gall-bladder. The cyst was loosened from its attachment to its surroundings and extirpated, and its pedicle ligatured. Death after three days. Postmortem showed that the tumor was a cyst from the choledochus  $15 \times 8 \times 7$  cm. in size, gall-bladder somewhat dilated. Ductus cysticus obliterated, duct hepatici dilated. The lower portion of the choledochus 3 cm. in length between the cyst and the papilla vateri was in the form of a chord, as thick as a goosequill, in its upper third provided with lumen, in its lower two-thirds without. As well as this, chronic perilobular pancreatitis. Obliteration of lower portion of choledochus was regarded as the result of cholangeitis.

18. WEISS, 1910. A boy of six years. Temporary attacks of pain in the right side, with icterus for more than a year. For half a year abdominal swelling. Clinical examination showed no icterus. Beneath the liver which was enlarged to a high degree a rounded tumor about as large as a fist, hard, mobile in respiration, diagnosed as echinococcus. After test puncture which yielded a clear yellowish-green fluid, symptoms of peritoneal irritation appeared, wherefore an operation was performed with sewing forward of the distended cyst in the abdominal incision, with three days later opening of the same. Death nine days later. Postmortem showed a flaccid cyst as large as a child's head proceeding from the choledochus, beginning at the junction of the cysticus and hepaticus. Sharply displaced upwards by a spur-like protuberance. Impossible to find duodenal opening. Hepaticus and extrahepatic gall-passages moderately dilated. Inner wall of cyst without epithelium. Weiss regards it as a congenital anomaly.

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19. BUTTERS, 1910. A boy of five, extremely icteric and emaciated. Abdomen considerably distended, especially to the right, where a large tumor of smooth surface can be felt. In operation a tumor was found below the liver from which was drawn three litres of gall-colored fluid. Death after some days of exhaustion. Postmortem, choledochus cystically dilated to a high degree.

20. ERKNER, 1911. Woman of twenty-three. Icterus in a high degree for one month. Wrongly diagnosed for pancreas cyst and operated. Postmortem (Professor Weichselbaum) showed a case of cystic enlargement of the choledochus containing five litres (this case is probably identical with that demonstrated by Miloslavich at the conference of the Society of Army Doctors of Vienna (Verein der Garmsonsärzte) on the 18th of November, 1911).

21. CLAIRMONT, 1911. A man of twenty-two. The previous history was characteristic, and the clinical appearance that regularly met with in these cases: That, namely of a large area of resistance, not distinguishable from the liver, situated under the edge of the thorax, and showing indistinct fluctuation, also icterus. Operation (v. Eiselsberg), after puncture of the cyst, which was as large as a child's head and contained two litres of pure gall, it was sewed to the abdominal wall and drained. In the evening of the day of the operation, the patient's life was threatened by severe hemorrhage, which, however, was checked. Richly secreting gall fistula, which, however, interfered but little with the patient's comfort. Death three days later of phthisis, and hemorrhage from the lungs. In the postmortem was found a fold of the membrane between the extra- and intraduodenal parts. This had probably caused an obstruction.

22. STERNBERG, 1911. A woman of twenty-five years. Operation performed by Bakes consisted of cholecystostomy and choledochoduodenostomy resulting in death "after some time." At the postmortem performed by Sternberg the gall-passages were found to be greatly enlarged, the choledochus formed a very large cyst, fastened on one side to the wall of the abdomen, and on the other to the duodenum, and open in both directions. Neither in the papilla vateri nor in the lower narrow portion of the choledochus was any alteration to be found in the form of a scar or similar formation, and there was also an absence of concrements. It was, therefore, a case like Ebner's of so-called "idiopathic choledochus cyst." At the point where the narrow part of the choledochus penetrated into the cyst a half-moon-shaped fold was found.

23. SCHLOESSMANN, 1911. A girl of seven. Had suddenly become ill with symptoms of peritonitis and icterus, while at the same time a resistance appeared in the right hypochondriac region. The reaction from the peritoneum disappeared, but the tumor, which clearly was cystic, remained. A test puncture was made, giving clear greenish fluid. In connection with this arose violent abdominal symptoms which necessitated an immediate operation (Sprengel). Gall peritonitis with fatty necrosis in the abdomen. Below the liver a cyst of the size of a child's head, adherent to its surroundings; this was opened and drained. Death from sepsis six days later. The postmortem showed that the cyst was formed from the choledochus duct, which was enormously dilated from its beginning to the vicinity of the papilla vateri. The cysticus and hepaticus opened into the upper part of the cyst in the lower, the terminal part of the choledochus protruding at an acute angle; in all three places, a fold could be discerned from inside. Gall-bladder small. Under the microscope the cyst wall was found to be a fibrous membrane, without elastic elements, and containing very few muscular fibres.

24. MAYESIMA, 1912. A boy of two years and two months. For ten months the child had had a gradually increasing swelling of abdomen, for four months icterus. In the upper part of the abdomen a tumor about as large as a man's head, filling out the right side and lower thorax aperture, extending over to the left mammillary line, downwards a finger's breadth above the symphysis, backwards to the region of the loins. In the place of the gall-bladder another tumor, rounded, about as large as a goose egg. Also ascites, and slight icterus. Operation, puncture of the enormous

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cystic tumor, and tapping of two litres of gall-colored fluid. In consideration of the child's precarious condition, further intervention was refrained from for the time. The puncture and the abdominal incision were sewed up. The patient got over the operation, but died two months later. Postmortem showed the cyst to be formed of the enormously dilated choledochus, its lower part only was of normal calibre, and had retained the lumen, but it was slightly kinked and passed in a valviform bend, obliquely downwards from the right, upwards to the left to the cyst.

25. HILDEBRAND, 1913. The patient, whose age and sex are not mentioned, had in the upper right hand portion of the abdomen a large cystic fluctuating tumor, also icterus in a high degree and acholic stools. In operation were found a distended gall-bladder, and a large cyst under the liver, which was pushed upwards by it. The cyst which contained four litres of bile, was opened and drained. There was a flow of bile outwards, but no bile in the intestine. At a new operation an anastomosis was made between the cyst and duodenum. In the beginning some of the bile went to the intestine, but not later on. The gall fistula would not close up. At a third operation, a new and larger anastomosis was made between the cyst and intestine. Sometimes the contents of the intestine entered the cyst and were discharged through the fistula. Hildebrand feared infection of the cyst, which, however, did not take place, and normal conditions were restored with the healing of the fistula. The patient was demonstrated in good health one year after the operation in Berlin's Gesellschaft für Chirurgie (Surgical Society of Berlin) July 14, 1913.

26. SEELIGER, 1913. A girl of thirteen years. The patient, who up to that had been healthy, had become ill some days previously with increasing ileus symptoms together with severe icterus. The abdomen, as a whole, much swollen, especially so in the right upper part, where there was considerable tenderness and rigidity. In the place of the gall-bladder, a smaller limited swelling. Operation showed a large cystic tumor on whose front side passed the duodenum, pressed quite flat, upwards to the liver the distended gall-bladder. Puncture, giving 750 cubic cm. of gall-colored fluid. The cyst was fixated to the abdominal wall and opened four days later. An abundant flow of bile and disappearance of icterus; fifteen days later at a second operation, an attempt was made to produce a connection between the cyst and duodenum, a very complicated operation. Death took place a week later. Postmortem showed limited peritonitis, the cyst had sunk together into a cavity as large as a child's head into which opened upwards duct cysticus and hepaticus; its lower connection with the duodenum could not, however, be ascertained with accuracy.

27. SCHILBE, 1913. The patient, a woman of twenty-five years, had never had any disturbance of the gall-passages previously; she came to the hospital with icterus of three months' standing, for some time high fever almost every day and a tumor twice the size of a fist, below the liver. Marsupialization of an enormous cyst between the liver and duodenum and ventricle, giving nearly four litres of gall-colored fluid. Fever continued, and icterus did not diminish, there was a strong flow of gall. Death took place eight days later from violent hemorrhage from the wall of the cyst. Postmortem showed that the cyst was the highly dilated common duct. The gall-bladder was small, the hepatic and the intrahepatic gall-ducts enlarged. Probing of the lower part of the choledochus from papilla vateri took place without any difficulty.

28. IPSEN, 1913. A girl of eighteen. Had suddenly become ill, six weeks before her reception into a county hospital, with pains under the right ribs. Three days later, icterus with dark urine and acholic stools; her condition remained unchanged. Was received into Rig's Hospital, Division C, June 6, 1912. Icterus in high degree. The right upper part of the abdomen occupied by a considerable swelling. Supposed to be caused by choledochus stone with gall stagnation in the liver. At operation, June 10, an enormous enlargement of the choledochus was found, and this contained about two litres of bile-like clear fluid. The hepatic duct and gall-bladder also much enlarged. No stone, no opening into the intestine to be

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seen. Drainage of gall-bladder and choledochus cyst. Severe cholangitic hemorrhage for a week, after which, however, the patient recovered somewhat, and the icterus diminished. The gall entered the intestine a month later, July 11, 1912, but death resulted from fresh hemorrhage. Postmortem showed the much shrunken choledochus cyst, which communicated with the intestine by a cord, fine as a hair upwards, but somewhat thicker downwards.

29. SMITH, 1915. A girl of seventeen. For five years increasing swelling of the abdomen, for four years periodic pains in the epigastric region, occurring regularly for three or four hours in the afternoon, and lasting on towards the evening. Never icterus. Protuberance of upper part of abdomen and lower part of thorax, proceeding from a considerable tumor which occupied the right hypochondriac and the epigastric region. Diagnosis, liver cyst (possibly echinococcus) or pancreas cyst. Operation, January 28, 1915. A rounded cystic tumor of the size of a man's head, firmly adhering to the under surface of the liver. Puncture, giving gall-colored fluid. "As one could not be certain regarding the point of origin of the cyst, and an incision with drainage does not appear to be very satisfactory, extirpation of the same was performed." In the course of this it was necessary to ligate four string-like formations, three from the upper part of the cyst going into the liver, and one from its lower part, 3 cm. long and as thick as a match, going towards the pancreas, all provided with lumina. The cyst contained three and one-half litres gall; in its wall lay the gall-bladder like a blind sac of the thickness of a lead pencil opening into the cyst, its place of entrance as well as those of the upper and lower gall-passages covered by crescent-shaped folds. Death eight days after operation. Postmortem showed that the duodenal part of the choledochus, which had been ligated 2 cm. from the papilla vateri, did not exhibit any stricture.

### B. NON-OPERATED CASES

30. DOUGLAS, 1852. A girl of seventeen. For an uncertain time pains in the liver, icterus in a moderate degree, and a swelling gradually increasing in size in the right hypochondriac region. This was accompanied by fever, wasting, and œdema in the legs. Test puncture showed gall-colored fluid. Death a fortnight later. Excessive enlargement of the choledochus, containing half a gallon of very ill-smelling gall, hepatic branches as thick as a finger. Gall-bladder and cysticus not enlarged. In the lower part of the cyst a funnel-formed opening, provided with a valve, leading into the lower, not dilated portion of the choledochus.

31. HEID, 1893. A girl of fourteen. For about six weeks pains in the region of the umbilicus, increasing icterus, and swelling of the abdomen. A considerably enlarged liver had been observed, below which was found a rounded tumor of a size and consistency varying with different occasions. Postmortem showed a liver weighing 3035 grams, a cystic enlargement of the choledochus as large as a child's head, its lower part 2.1 cm. long was not engaged in the dilatation, and was kinked, but could be easily probed from the intestine.

32. BROCA, 1898. At the postmortem of a ten-year-old girl was found a cystic enlargement of the size of a child's head. The passage showed no obstruction or obliteration, but an angular curvature between the cyst and duodenum.

33. WETTER, 1905. Girl of fifteen. From the age of five had been subject to attacks of cramp of the stomach with vomiting, from the age of seven occasional icterus. In the epigastric region a rounded, soft tumor, sensitive to the touch, the size and consistency of which were increased after meals. Besides this icterus, fever and signs of ascites. Postmortem showed tumor twice the size of a fist, originating from dilatation of the choledochus. The lower part of the passage bent at an angle, going downwards from the cyst upwards to the duodenum was easily probed.

34. HEILIGER, 1910. Described in text.

In all the cases quoted above, the diagnosis of idiopathic choledochus cyst seems to be without doubt. In the literature on the subject there are, however, several cases related, of a high degree of cystic dilatation of the choledochus, which, either on account of incomplete data or from the existence of a real hindrance in the form of stone, tumor formations in the lower part of the choledochus, or chronic pancreatitis, cannot be reckoned offhand as belonging to this category, despite the fact that the pathogenesis not improbably—at least for some of them—seems to be the same.

To these cases belong Todd's (1817), Fabre's (1831), Barlach's (1876), Legg's (1876), Raynaud and Sabourin's (1879), Oxley's (1883), Wilkes-Moxon's (1889), Brunner's (1889), Mayo Robson's (1893), Eve's (1906), and Milner's (1909).

#### BIBLIOGRAPHY

Arnolds: Mannskopfgrosse Retentionscyste des Choledochus. Deutsche med. Wochenschr., 1906, No. 44. Verein der Arzte Dusseldorf, p. 1804.

Ashby: Medical Chronicle, October, 1898, p. 28 (cit. Mayo Robson, Diseases of the Gall-bladder and Bile-ducts, 3d ed., p. 199).

Arnison: Cit. Mayo Robson, p. 200.

Butters: Choledochus Cysten, Deutsche med. Wochenschr., 1910, p. 1351. Gitzungsbericht, Arztlicher Verein, Nürnberg, Jan. 20, 1910.

Bakes: Kolossal dilatation ductus Choledochus. Idiopathic Retentionscyste. K. K. Gesellschaft der Arzte in Wien. März 1, 1907. Wiener klin. Wochenschr.

Bakes: Compte rendu du deuxième Congrès de la Société internationale de Chirurgie, Bruxelles, 1908, p. 112. Choledochusretentionscyste.

Bakes: Diskussion zur Choledochuscyste, 38 Deutsche Chir. Kong., 1909, Verhandl. I, 172.

Baschkirow: Zur pathogenese der Cysten des Choledochus. Kuss. Arkiv. Vellgaminona, 1911, Heft I, p. 63.

Clairmont: Diskussion zu Typische Erweiterung des Choledochus. Wiener klin. Wochenschr., 1911, No. 46, p. 1615.

Ercner: Ibid.

Brun-Hartmann: Bulletin de la Société de Chirurgie, 10 mars, 1907 (cit. Mathieu, Rétrécissements non néoplastiques des voies biliaires principales. Revue de Chirurgie, xxvii année, Nos. 1 and 2).

Dreesmann: Angeborne Choledochuserweiterung. Deutsche med. Wochenschrift, 1906, No. 37, p. 1518.

Zur Kenntniss der Kongenitalen Anomalien der Gallwege. D. Zeitschr. für Chir., vol. 92, p. 401.

Broca: Dilatation énorme du Canal Choledoque. Bulletin et Mém. de la Société de Chir. de Paris, G. 23, p. 209 (ref. Zentralblatt für Chirurgie, 1898, June 30).

Ebner: Idiopath Choledochuscyste und Purpura hemorrhag fulminans. Bruns Beiträge, vol. 64, p. 472, 1909.

Ebner: Über Choledochuscysten (Demonstration) Verhandl. Der Gesellschaft für Chir., 38th Chir. Kongr., 1909, Verhandl. I, p. 170.

Eve: Large Cyst of the Common Bile Duct. Transactions of the Clinical Society of London, vol. xxxix, 1906, p. 144. British Med. Journal, 1906, vol. i, p. 802.

Edgeworth: Case of Dilatation of the Common Bile Duct, Simulating Distention of the Gall-bladder. Lancet, 1895 (May 11), p. 1180.

Douglas: Monthly Journal of Medical Sciences, 1852 (cit. Kolb). Case of Dilatation of the Common Bile-duct.

Heiliger: Die Kongenitale Cystenartige Erweiterung des Choledochus. Inaug. Diss. Giessen, 1910.

## IDIOPATHIC CHOLEDOCHUS CYST

Hildebrand: Geheilte Choledochuscyste. Deutsche Med., 1913, No. 45, p. 2224.

Goldammer: Beiträge zur Chirurgie der Gallwege. Bruns Beiträge, vol. 55, p. 214 (Cystische Erweiterung des Choledochus).

Heid: Ein Fall von hochgradiger Cystischer Erweiterung des Choledochus. Inaug. Diss. Gießen, 1893.

Ipsen: Et tilfaelde af Choledochuscyste. Hospitals tidende, 1913, p. 1342. N. M. Aek.

Konitzky: Ein Fall von hochgradiger zystischer Erweiterung des ductus Chole-

dochus. Inaug. Diss. Marburg, 1888.

Lavenson: Cyst of the Common Bile Duct. American Journal of Medical Sciences, 1909, April, vol. 138, p. 463.

Mayesima: Zur Kasininstsel der primären cystischen Erweiterung des ductus Choledochus. Deutsche Zeitschr. für Chir., vol. 119, p. 338.

Mayo Robson: Diseases of the Gall-bladder and Bile-ducts, p. 195.

Miloslavich: Kongenitale Choledochuscyste. Wiener med. Wochenschrift, 1911, No. 60, Beiträge 23, p. 267.

Milner: Dilated Gall Ducts in a Child. British Med. Journal, 1909, May 22, p. 1235.

Kolb: Zur Pathologie der Gallwege. Fall von hoch gradiger cystenartiger Er-

weiterung des ductus Hepaticus und des ductus Choledochus. Inaug. Diss. München, 1907.

Letulle: Dilatation kystique des voies biliares. Cholangiectasis congenitale. Presse Médicale, 1913, No. 10, p. 97.

Nicolaysen: Tumour cysticus ductus hepatici et choledochi dilatati. Nord. Med. Arkiv, 1899, No. 16.

Kostowzew: Ein Fall von Kolossaler Zystenartiger Erweiterung des Ductus Choledochus. Deutsche med. Wochenschr., 1902, vol. 28.

Russell: Case of Dilatation of the Common Bile-duct. ANNALS OF SURGERY, 1897, December, p. 692 (cit. Mayo Robson).

Schloessmann: Beiträge zur Kenntniss der Choledochuscysten. Deutsche Zeitschr. für Chir., vol. 109, p. 160.

Seyffert: Ein Fall von hochgradiger cystischer Erweiterung des Duct. Chole-

dochus. Inaug. Diss. Marburg, 1888.

Smit: Et tilfaelde af idiopathisk Choledochuscyste. Medicinsk Revue, 1915, No. 32, p. 285.

Swain: A Case of Cholecystenterostomy with the Use of Murphy's Button. Lan-

cet, 1895, March 23, p. 743.

Terrier: Cit. Mayo Robson.

Weiss: Geltener Fall von Cystenartiger Erweiterung des Choledochus. Berliner klin. Wochenschr., 1910, No. 40.

Wettwer: Fall von Kongenitaler Choledochuscyste. Diss. Göttingen, 1907;

Münchener med. Wochenschr., 1907, No. 25.

Sternberg: Diskussion zur Typischer Erweiterung des Choledochus. Wiener klin. Wochenschr., 1911, No. 46, p. 1615.

Bazy: Resultats éloignées des anastomoses enterobiliares. Bulletin de l'Académie de Médecine, 1916, No. 6.

Seeliger: Beitrag zur Kenntniss der Ichtin Choledochuscysten. Bruns Beiträge zur klin. Chir., vol. 99, 1 heft, p. 158, 1916.

Todd: Dublin Hospital Reports, 1817, p. 328 (cit. Eve).

Wilkes and Moxon's Pathology, 3d ed., 1889, p. 485 (cit. Eve).

Oxley: Lancet, 1883, p. 988.

Barlach: D. med. Wochenschr., 1876, No. 31 (cit. Eve).

Brunner: Virchow's Archiv, Nov., 1899 (cit. Eve).

Legg: Cit. Kehr.

Raynaud et Sabourin: Cit. Kolb, p. 29.

Veau: Rétrécissements congenitales des voies biliares et leurs traitement chirurgi-

cal. Presse Médicale, 1910, No. 52, p. 475.

Kehr: Chirurgie der Gallwege. Neue Deutsche Chirurgie, vol. 8.

## RELATIVE INDICATIONS FOR CHOLECYSTECTOMY AND CHOLECYSTOTOMY

BY FRANCIS ROE BENHAM, M.D.

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FOR years these operative procedures, cholecystectomy and cholecystotomy, have been discussed *pro* and *con*. Each has its place in the armamentarium of the surgeon.

A few years ago the drainage operation was the procedure of choice. To-day cholecystectomy is performed by most surgeons. Many circumstances have brought about this radical change.

Cures were not effected when there was every reason to believe there would be. The old symptoms of pain and distress returned. Cholecystitis recurred and far too frequently gall-stones were found. Secondary operations were necessary in many cases because of a return of the original symptoms. The surgeon was not satisfied with his work; the spirit of unrest and dissatisfaction pervaded the operative procedure for cholecystitis with and without gall-stones.

Flexner tells us the gall-bladder acts to render the bile less irritating to the pancreas. Another function of the gall-bladder is to pump the bile into the intestine. Pressure seems necessary to carry the bile through the ring sphincter muscle of Archibald at the ampulla. This is one reason the gall-bladder was thought needed by its rhythmic contractions to force the bile into the intestine. Drainage of the gall-bladder, because of adhesions to it, partially destroys this pump-like action.

It is found in certain clinics that one in every seven women is afflicted with gall-stones, and one man in every eleven. Cholelithiasis must then be considered one of the most common diseases of the upper abdomen. Gall-stone colic is not necessary to have gall-stones; in fact, many times gall-stone colic is a persistent symptom where no gall-stones are found. The gall-bladder may be filled with stones and the patient have no symptoms of the disease. Gall-stones may remain quiescent in the gall-bladder for a long time and be discovered when operating for other conditions and at autopsies.

Considering cholelithiasis as one of the most common diseases of the upper abdomen, the treatment is of vital importance. It is strictly a surgical disease and should be treated surgically and as soon as diagnosis can be made. A continued irritation of the gall-bladder by stones and cholecystitis is, undoubtedly, a causation factor in the production of malignancy. The operations for this condition, cholecystotomy or cholecystectomy, are operations which have been much discussed and about which many volumes have been written. Deaver says, as far as the operative interference is concerned, in experienced hands the mortality is about the same.

## RELATIVE INDICATIONS FOR CHOLECYSTECTOMY

The frequency with which these cases are afflicted with recurrence is, I believe, largely responsible for the wide variance of opinion regarding the operation of choice. Why should so many cases recur after operation if all the stones are removed at the time of operation? Gall-bladders and ducts in which there have been stones for a long period of time, even years, must undergo pathological changes of many difficult kinds. The gross anatomy of a gall-bladder filled with stones or partially filled with stones changes in size and appearance. In some cases a gall-bladder becomes twice its normal size, and the bladder wall thick and tense from frequent exacerbations of cholecystitis. Gall-stones which plug a duct cause dilatation of the duct in which they are lodged. Is it any wonder after all these changes from normal to abnormal, and from anatomical to pathological, the ducts distorted and tortuous with numerous dilatations, contractions and adhesions, that stones escape detection? Considering recurrence from this phase, it seems more than likely that many cases of so-called recurrences are not recurrences in the truest sense, but are caused by stones escaping detection at the time of the operation. Undoubtedly a good many cases of so-called recurrences are caused by a stone or stones escaping detection. On the other hand, if all the stones are removed at the operation and the causes which are necessary for the formation of gall-stones are still remaining, what will prevent reformation?

Cholecystotomy will not permanently cure gall-stones if a diseased appendix remains to distribute infection to the gall-bladder contents and cause attacks of cholecystitis, with bile stagnation in the gall-bladder and the precipitation of bile salts. Rosenou has shown that the infection of the gall-bladder is interstitial. With every condition needed for the reformation of stones, a recurrence is inevitable. This seems to me to be a very strong argument in favor of cholecystectomy. The gall-bladder is the most common site in which the stones are found, and the cystic duct the most common duct to be affected. They also occur in the hepatic and common ducts.

Seventy-five per cent. of gall-stones are found in women and in eighty per cent. of these women the symptoms develop during pregnancy (Mayo).

One-fourth the diseased gall-bladders with symptoms of cholelithiasis do not contain stones.

The symptom of gall-stone colic is caused by mucous balls and thick, heavy bile. It is the violent peristalsis which causes the colic.

The entire function of the gall-bladder is unsettled. Many theories have been expounded. Cases enjoy the best of health and suffer no recurrence following cholecystectomy. In view of the facts, namely, the frequency of recurrence from stones being overlooked, also the conditions needed for reformation remaining, and the gall-bladder the most common location, cholecystectomy seems to be the preferable operative procedure.

As to the mortality, cholecystectomy seems to have had a larger death rate. It is undoubtedly a more serious operation.

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The technic followed by most surgeons to-day is through a median high incision, if needed, to the ensiform cartilage, so that the liver can be rolled out toward the median line, using the gall-bladder as a tractor, thus exposing the gall-bladder to view and making it so accessible for operation.

When the gall-bladder gives marked evidence of associated functional derangement of the stomach, cholecystectomy should be performed, whether or not stones are found (Mayo).

No absolute rule can be laid down for either cholecystectomy or cholecystotomy. Many circumstances may interfere. There is little doubt that removal of the gall-bladder is a longer operation and entails more trauma. Indications for cholecystectomy may be present, but the condition of the patient may not warrant this operation. Every case, it seems to me, must be a law unto itself. Generally speaking, cholecystectomy should be performed when the following conditions are present: First, when the stones occupy the gall-bladder; second, cholecystitis without stones; third, where wall of gall-bladder is diseased; fourth, stone in cystic duct or any obstruction to cystic duct; fifth, adhesions around the gall-bladder which interfere with its pump-like action; sixth, in the case of the strawberry or papillomatous gall-bladder; seventh, malignancy.

Cholecystotomy should be used: First, in cases of pancreatitis with jaundice; second, in the very old and feeble cases or in those cases of poor physical conditions; third, in those cases where the operation would be dangerous because of the inaccessibility of gall-bladder.

It seems that both operations have a very important field. It is not a case of elimination of one or the other, but a case where each operation has very definite indications, as has been shown by Deaver, Mayo, Judd, and others.

The appendix is the focus of infection of most upper abdominal diseases (Deaver).

As infection plays such an important rôle in the production of gall-bladder diseases, it behooves us in all cases to examine and remove the appendix should there be the slightest indication.

## TORSION AND INFLAMMATION OF THE APPENDICES EPIPLOICÆ

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THE appendices epiploicæ were first described by André Vesalius. Later, anatomic studies were made by Fabricius, Spiegel, Riolan, Glisson, Bartholin, and Willis. The modern anatomists give but scanty references to these structures. This is strange, because the appendices epiploicæ have a special and definite anatomical system, and in addition present a surgical interest owing to their peculiar and important pathology. It is a question whether the term appendix epiploica is sufficiently definite and descriptive, owing to the failure to suggest the peritoneal origin and nature. In order to obviate this criticism, Robinson recommends the use of the term, Sero-appendix-epiploica. He adds to this expression the words, pericardial, pleural, synovial, to indicate the fatty tabs that are found in the pericardium, pleural cavity, and in the joints, and that have a similar histological structure. Among the numerous and varying terms used by anatomists are: appendices epiploides (Meckel), appareil sero-graissieux (Poirier), and omentula. Attention has been called to the possible verbal confounding of the appendix epiploica with the veriform appendix. This is likely in the older literature, in which surgeons and anatomists used the term appendix to designate a diverticulum. Discrimination is needed in this regard, because intestinal diverticula,—for example, Meckel's diverticulum,—may form the sole content of an abdominal hernia.

The appendices epiploicæ are generally arranged in two rows along the wall of the large intestine. They are in intimate relations to the longitudinal bands of the colon. It may be recalled that the muscular coat of the large intestine consists of external longitudinal and internal circular fibres. On the cæcum and the ascending transverse and descending colon, the longitudinal fibres are arranged in three bundles, known as the *tæniæ coli*, the intervening part of the wall being almost destitute of longitudinal fibres. These three bundles unite at the attachment of the veriform appendix to the cæcum. From this point, an anterior *tænia* (*tænia libera*) passes to the front of the cæcum and then ascends in a similar fashion on the ascending colon. These longitudinal bands or *tæniæ* are called, according to their location, the anterior, the posterior superior, and the posterior inferior. The line of origin of the appendices epiploicæ coincides very closely to the anterior and the posterior inferior *tænia*. Occasionally one row of appendices epiploicæ exists; rarely are there three rows. The veriform appendix has two rows of appendices epiploicæ, one on each side and projecting from its mesentery close to the appendix. They are best marked on the transverse colon and on the pelvic colon. They are seldom conspicuous

on the cæcum. On the ascending and descending colon, they are mainly attached to the median and lateral surfaces. On the transverse colon, they spring almost entirely from the anterior surface, being attached between the two longitudinal bands—termed *tænia mesocolica* and *tænia libera*—and when well developed form the adjacent part of the transverse colon. On the pelvic colon, they often form two somewhat irregular rows, situated on each side of the bowel; they gradually become smaller in size and fewer in number toward the end of the pelvic colon. They are absent from the rectum.

The shape varies greatly. They may be conical, saccular, lobulated, cylindrical, or flattened with the borders more or less fringed. As they are formed by a simple reduplication of the peritoneum, there exists a potential space between the two serous surfaces. By the injection of fluid or by the insufflation of air, the capacity of the cavity has been determined to range from one to ten c.c. of distilled water. Distention of these spaces has been found at autopsy in patients dying from ascites or anasarca. The conical type may be as long as 15 centimetres. The smallest is less than one centimetre long. The weight varies from 25 centigrammes to one gramme or more, according to the amount of fat present. About one hundred is the average number present in an individual. In three cadavers examined, the following figures were obtained: 82, 95 and 108.

The appendices epiploicæ that arise from the posterolateral *tænia* come in contact with the parietal peritoneum. Those arranged along the postero-medial *tænia* are in relation with the mesentery of the colon. Occasionally an appendix epiploica comes in contact with one of the potential hernial orifices of the abdominal wall, such as the inguinal, femoral, or umbilical. An appendix epiploica may occupy one of the retroperitoneal fossæ, such as the intersigmoid. The blood supply is derived from the superior and the inferior mesenteric arteries. These branches arise from the vascular arcade formed on the anti-mesenteric border of the intestine and pass directly to the distal extremity of the appendix. The veins empty ultimately into the superior mesenteric, the inferior mesenteric, and occasionally the renal veins. The lymphatics have not been studied.

The physiological value of the appendices epiploicæ remains unknown. That they play a part in some physiological process is quite probable. Because of their close resemblance to the omentum, it has been assumed that they possess a similar function. The animal experiments and the deductions therefrom concerning the function of the omentum are well analyzed and presented in Robinson's thesis. He points out that a general conclusion is reached that the omentum is a protective and defensive organ whose function is to filter and destroy bacteria; to render innocuous, harmful toxins; and to act as a leucocytic and phagocytic organ. That the appendices epiploicæ—simple in structure and presenting no evidence of a specialized function as indicated by a complex histology—act like the omentum is extremely unlikely.

Robinson is of the opinion, however, that the appendices epiploicæ are

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concerned with the movement of fluids in the large intestine. This belief is based upon a cadaver experiment in which water under varying pressure was injected into the colon and the behavior of the appendices epiploicae noted. The experiment consisted in ligating the terminal ileum close to the ileoæcal valve, opening the ileum distal to the ligated point, and inserting therein a cannula. The cannula, in turn, was so connected with a capacious syringe that water could be introduced into the colon deliberately and under varying pressure. Robinson noticed that as the fluid flowed through the colon the appendices epiploicae became raised from the surface of the intestine so that they projected directly outward. If the fluid ran rapidly and continually, and was permitted to escape per anum, unhindered, the appendices epiploicae produced a curious, fluttering dance-like movement which the experimenter aptly compares to the view produced by a forest of trees when viewed from the window of a rapidly moving train. The experiment was varied by partial or complete obstruction of the colon. This modified the motion of the appendices epiploicae. These experiments have not, to the writer's knowledge, been repeated or verified.

An analysis of the literature discloses the fact that the essential and dominant lesion in the pathology of the appendices epiploicae is torsion or twisting of the pedicle. If this is associated with infection, the conditions assume a practical and surgical importance, owing to the relief obtainable through operative intervention. If infection is absent, the pathology becomes of academic interest, for under these circumstances simple necrosis of the pedicle results in detachment of the distal end, which then becomes a foreign body of the peritoneal cavity. If infection is associated with the lesion, peritonitis may develop, and, in passing, it is important to state in this connection that torsion of an appendix epiploica is a possible source of infection in so-called cryptogenic peritonitis.

It is not definitely known how bacteria reach the appendices epiploicae. Their probable source is, undoubtedly, from the colon. In a case reported by Riedel, a free culture of colon bacilli was obtained from the interior of an inflamed and twisted appendix epiploica. These phenomena—torsion and inflammation—may take place though the appendix epiploica lies not in the abdomen proper but within a hernial sac.

The occurrence of foreign bodies in the peritoneal cavity has been known for many years. Cruveilhier was the first to mention this topic. He did not, however, associate their origin with the appendices epiploicae. He pointed out, however, the liability of these foreign bodies to cause peritonitis, and incidentally called attention to the striking similarity between these and the loose bodies of the joints, a relation that, of course, is actual. Deville, in 1851, exhibited before the Société Anatomique five foreign bodies which were found in the peritoneal cavity at autopsy. Though an inspection of the transverse colon revealed an appendix epiploica on the verge of becoming detached, Deville failed to associate this lesion with the formation of the loose bodies. He mentioned casually, however, the striking simi-

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larity in appearance between this particular appendix epiploica and the foreign bodies.

Virchow was the first pathologist to demonstrate the actual etiology and formation of the foreign bodies of the peritoneal cavity. He showed that as a result of obesity or an infection an increased amount of fat is deposited in the appendices epiploicae. This fat undergoes saponification and calcification, which causes an increase in weight, and which in turn leads to gradual and progressive obliteration or obstruction of the blood-vessels of the pedicle. When the vascular obstruction or obliteration is complete, necrosis occurs and the freed and liberated appendix epiploica then falls into the peritoneal cavity.

Some time before Virchow presented his explanation, Hodgkin had called attention to the condition, in describing cases found at autopsy. Like Cruveilhier and Deville, he failed to recognize these foreign bodies as detached and calcified appendices epiploicae.

Intra-abdominal torsion and inflammation may produce abdominal and peritoneal symptoms which are acute in onset and which simulate closely those of acute appendicitis. A case in point is the following, which came under the writer's care and observation in the second surgical division of Fordham Hospital.

M. G., single, age twenty-nine years, admitted December 12, 1916. Occupation: Cashier. Family History: Parents living and well. Two brothers and one sister alive and well. Previous History: Measles at age of six years. No other illness. Always constipated. Appetite excellent. Sleeps well. No disturbance of urination. Smokes a good deal. A moderate use of whiskey. No previous surgical condition or operation. Venereal History: Denied.

Present Illness: Began two days ago. Was awakened from a sound sleep with severe sharp pain in the right lower quadrant close to the median line. The pain did not radiate. It was increased by reclining, and alleviated by walking, and the application of a hot water bag. The taking of sodium bicarbonate and hot whiskey failed to give relief. Soon after the onset the patient took castor oil, which was rapidly vomited. He has not vomited since. An enema failed to secure a bowel movement; the bowels have not moved for four days. The pain increased in severity, in spite of the use of opiates. Chief complaint on admission: severe pain in the lower right quadrant.

Physical Examination: Patient has a moderately strong physique. Heart and lungs negative. The abdomen was distended. Tenderness over McBurney's point. Slight rigidity. No mass felt. Temperature, 100; pulse, 98; respiration, 24. Urinalysis: cloudy—straw color—sp. gr., 1016; acid: faint trace of albumin. No casts.

The diagnosis of acute appendicitis was made. Acute cholecystitis was excluded owing to the low situation of the tenderness.

Operation: Ether narcosis. Right rectus incision; no free fluid. The appendix was easily found. It was small, almost obliterated, and not inflamed. The abdomen then systematically explored. The stomach, duodenum, gall-bladder, kidney, and small intestine presented

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no evidence of disease. It was evident that the appendix was not the cause of the symptoms. At the completion of this examination, the sigmoid was inspected, with the view of looking for a diverticulum. The sigmoid was extremely long and redundant and could be easily brought out through the rectus incision without traction or dragging. At the middle of the convexity of the sigmoid was found an appendix epiploica presenting evidence of acute inflammation. The pedicle was twisted. The appendix epiploica was removed by ligation of the pedicle. Appendectomy. Closure of abdominal wound. Complete recovery.

Pathological Examination: (No. 6033). The specimen sent for pathological examination was an appendix epiploica, consisting of a large amount of fat tissue with variously sized endothelial cells surrounded by a capsule of fibrous connective tissue. Parts of the capsule are infiltrated with inflammatory corpuscles, and the endothelial cells have undergone various degrees of proliferation. The specimens show an acute inflammatory condition without degenerative changes.

The cases reported by Briggs and Zoppritz are similar to that of the writer, save that in their cases the appendices epiploicæ were attached to the caecum.

That an appendix epiploica might cause acute intestinal obstruction by acting like a band, was first noted by Cruveilhier. Cases of this nature have been reported by Riedel and Schweinberg. Malgaigne and Cruveilhier were the first to point out that femoral, inguinal, and umbilical herniae may exist, the solitary content of which may be an appendix epiploica that may remain there for many years and not provoke trouble. On the other hand, torsion and inflammation may occur while the appendix epiploica is in the sac, the symptoms mimicking those of incarceration or strangulation. The same pathological process, necrosis and the formation of foreign body, may occur within the hernial sac. An appendix epiploica may adhere to the wall of the sac and thereby cause a hernia to be irreducible.

An inflamed and twisted appendix epiploica should be removed. Simple ligation is sufficient. The diagnosis will remain obscure until more cases have been collected and the histories and symptoms analyzed. Removal is indicated when the appendix epiploica produces obstruction by its band-like action. If casually found in a hernial sac, it should be advantageous to practise excision, because the vascular disturbance might favor the occurrence of torsion if the appendix epiploica were returned to the abdomen.

### APPENDICES EPIPLOICÆ AS FOREIGN BODIES

CASE I.—LITTRÉ. (*L'Histoire de l'Académie Royale des Sciences*, 1703, p. 38. Abstracted by Robinson.) Littré during the dissection of a cadaver found a hernia, the sac of which did not communicate with the abdominal cavity as the neck was greatly narrowed. A portion of the omentum was attached to the circumference of this opening. In the same abdomen, Littré found a hard oval body one inch long, ten lines broad and seven lines thick. It was free and

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unattached. In the centre was a round stone, white, and about the size of a pea.

CASE II.—LAVERAN. (*Gazette des Hôpitaux*, 1895, No. 119, p. 474.) In an autopsy on a patient dead from chronic dysentery, the intestinal loops were firmly adherent and in the centre of this mass were twelve fibrocartilaginous bodies, the size of a small ball, with elastic resistance and a stratified structure.

CASE III.—CRUVEILHIER. (*Anatomie pathologique générale*, tome III, 1894, p. 816.) In the abdomen of a soldier dead from an unknown illness, was found a foreign body the size of a billiard ball. It was free with no trace of adhesions or pedicle. The color was white and the surface smooth. It was of extreme hardness. Cruveilhier adds, that he has been told of a case of strangulated hernia, in which the surgeon found a free foreign body the size of a pea, in the sac. It was a free cartilaginous body. The patient recovered.

CASE IV.—VIRCHOW. (*Die Krankhaften Geschwulst*, Berlin, 1863.) Details a case in which the foreign body was hard, and calcified. It lay free in the abdominal cavity. As the patient had had symptoms of peritonitis, it was suggested that the foreign body came from the veriform appendix. But an analysis of the free body failed to show the signs of an fecolith. The veriform appendix was furnished with appendices epiploicæ, and at its tip was a small atrophied appendix epiploica, which caused one to assume that the foreign body had this origin.

CASE V.—SCHEDE. (*Aertzlich. Verein*. Hamburg, 1894.) Reported a case, before the Medical Society of Hamburg, of a foreign body free in the peritoneal cavity. The patient presented the symptoms of ileus. At operation a tumor was felt in the pelvis. It was hard and about the size of an egg. The mass was free. It was removed and found to be a calcified appendix epiploica.

CASE VI.—TOMELLIMI. (Abstracted by Robinson.) During an autopsy in a man dead from cardiac paralysis, it was noted that the appendices epiploicæ of the transverse colon and sigmoid were straighter than usual. Tomellimi found a flattened appendix epiploica, the same color as the others, bound to the fatty mass by a thin pedicle. On examination, this pedicle was found to have undergone a true torsion around its long axis.

CASE VII.—NERI. (*Riforma medica*, 1904.) Observed during laparotomy several corpora aliena composed of fatty tissue within a connective-tissue envelope.

CASE VIII.—RIEDEL. (*Münch. med. Woch.*, Nov. 28, 1905.) Male. The symptoms presented resembled those of biliary colic. The diagnosis was adhesions around the gall-bladder. Operation showed two foreign bodies in the abdominal cavity. They were formed from the appendices epiploicæ. The operation did not cure the patient. The pains returned, and at the end of three years he committed suicide. At autopsy, two other foreign bodies were found.

CASE IX.—RIEDEL. (Ibid.) Male, age twenty-five years. Four years before he had been operated upon for an appendical abscess. The

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distal (gangrenous) part of the appendix was removed. Three weeks before admission, an abscess formed in the umbilical region, and ruptured spontaneously. No fistula. As a large hernia existed in the original incision and as the cause of the umbilical abscess was not known an operation was performed. A median laparotomy disclosed two foreign bodies in the peritoneal cavity. They were yellow and round. They were 1.5 cm. long, and .75 cm. thick.

CASE X.—RIEDEL. (Ibid.) Male, age thirty-two years. Complained of pain in the gall-bladder region, accompanied with jaundice. Examination showed a large liver, no tumor, no fever. At operation, no calculi were found. The gall-bladder was removed on a suspicion of cholecystitis. Two foreign bodies were found slightly adherent to the under surface of the liver. They were round and fatty. They were  $\frac{3}{4}$  cm. long.

CASE XI.—RIEDEL. (Ibid.) Female, age 41 years. For eight days previous to admission had complained of pain in the hypogastrium; painful micturition; chills, vomiting finally becoming fecal in character. Examination showed great distention of the small and of the large intestine. Marked signs of peritonitis. As cause of this peritonitis, an appendix epiploica of a semilunar shape was found attached to the descending colon. The extremity was fat, grey, 1.5 cm. long, and 1 cm. wide and not twisted. Abdomen closed after lavage. Death. Autopsy showed no other cause of peritonitis. In the centre of this foreign body composed of fat, were found colon bacilli.

### APPENDICES EPIPLOICÆ AS CAUSE OF INTESTINAL OBSTRUCTION

CASE I.—RIEDEL. (*Münch. med. Woch.*, No. 28, 1905, p. 2308.) In this case, the distal distended end of an appendix epiploica was in the form of a foreign body. This was shrivelled up in the centre, greyish color and isolated in the abdominal cavity. The corresponding pedicle, which in fixing the small intestine had caused the ileus, originated probably from the caecum, though this was not definitely determined. A microscopical examination of the distal end of that part of the pedicle surrounding the small intestine, showed it to be composed of fatty tissue without nuclei. The foreign body was also formed of non-nucleated fat tissue. Riedel concludes from this that the foreign body and the pedicle were of the same nature.

CASE II.—RIEDEL. (Ibid.) Male, age forty years. Three days before admission, complained of severe abdominal pain. Vomiting. Examination disclosed a robust man; abdomen slightly distended; no tumor; no visible peristalsis. Operation showed the jejunum greatly dilated. Free peritoneal fluid. In the right iliac fossa was an appendix epiploica twisted at its middle and gangrenous at the distal end. It arose from the median band of the caecum and was adherent, by its twisted and gangrenous extremity, to the mesentery of the small intestine. The centre part of the appendix epiploica crossed the ileum 10-12 inches above the ileocaecal valve. Where it crossed, it produced an obstruction. The appendix epiploica was removed and the obstruction relieved by enterotomy. Death. Autopsy disclosed peritonitis.

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TORSION AND INFLAMMATION OF AN APPENDIX EPIPLOICA

CASE I.—BRIGGS. (*Amer. Jour. of Med. Sciences*, No. 135, 1908, p. 869.) Male, age thirty-five years. Previous history negative. Five days before admission, he had a severe pain in the right iliac region. This subsided with morphine medication. Examination revealed tenderness over the appendix and a mass in the right iliac region. The pulse was 80; temperature normal. These findings remained unchanged for five days when the temperature became 100, and operation decided upon. Operation revealed a dense tumor one and one-half inches long, and one inch in width; having the appearance of a haemato-ma with a peritoneal envelope. It was unusually adherent and was attached to the cæcum by a narrow and twisted pedicle. The appendix, though normal, was removed. Recovery. Microscopic examination showed the tumor to be an appendix epiploica. The vermiciform appendix was normal.

CASE II.—ZOPPRITZ. (*Semaine Médicale*, No. 6, April 21, 1909, p. 192.) Male, age twenty years. This case of acute torsion verified and cured by operation, occurred in the service of Anschutz in Kiel.

Three weeks before admission, the patient complained of moderate abdominal pain, of a cramp-like nature. The onset of the illness was extremely sudden, with severe pain in the hypogastrium. Temperature 38.2. No vomiting. Pulse 96. The pain persisted. It was most intense in the right half of the abdomen. No dulness on percussion. Tenderness over McBurney's point. The diagnosis lay between acute appendicitis and acute cholecystitis. Operation: Right rectus incision. Appendix normal. The incision was lengthened. A small discolored mass, moving with respiration, was found adherent to the omentum. The adhesions were broken. The mass, the size of a prune, was an appendix epiploica, taking origin from the transverse colon. It was twisted 180 degrees. It was removed. Appendectomy. Recovery.

APPENDICES EPIPLOICÆ FOUND IN HERNIA

CASE I.—RIEDEL. (*Münch. med. Woch.*, No. 28, 1905, p. 2308.) Female, age fifty-six years. For two years has had a right inguinal and a left femoral hernia. Two days before admission, suffered severe pain in the left groin. On examination, a right reducible hernia; left side, in femoral region an irreducible tumor, the size of a nut, hard consistence and almost painless to pressure.

Immediate operation showed a femoral hernia. In the sac, there was an appendix epiploica twisted once on its axis and adherent by its distal extremity. It was 1 cm. long, 2 mm. thick and of a yellow color. Necrosis had already begun. The pedicle was ligated, the sero-appendix removed. Radical cure. Recovery.

CASE II.—RIEDEL. (*Ibid.*) Female, age twenty years, entered the hospital, August 14, 1905. For the past ten years, she has had a left reducible femoral hernia. For the past few months, she has had a right irreducible femoral hernia. The day before admission, the patient experienced a sharp, violent abdominal pain. At the same time, the left femoral hernia became tender. Operation disclosed, in

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addition to a small amount of fluid, a fatty structure, 1 cm. long and 5 mm. thick, suspended to the wall of the sac by a thin pedicle of flesh fibrin. Resection of the sac, and radical cure. Recovery.

CASE III.—LORENZ. (*Bericht-über einen Seltenen Operations Befund, Wiener klin. Woch.*, vol. xviii, p. 1367.) Female, age thirty-three years. Complains of a right inguinal hernia, accompanied with general malaise, abdominal pain and complete stoppage of the passage of flatus. Operation showed in the sac among the intestinal loops, a thin band, six cm. long, starting from the meso-sigmoid and inserted into the neck of the sac. Around this an appendix epiploica had passed, twisting itself 360 degrees. It was strangulated. Small flakes of fibrin were seen on the parietal and visceral peritoneum. At the end of the twisted appendix epiploica there were subperitoneal effusions of blood. The pedicle at the point of strangulation was gangrenous. The band and the appendix epiploicæ were resected. Radical cure. Recovery.

CASE IV.—VON BRUNS. (*Bruch einklemmung der Appendices epipl.*, *Münchener med. Woch.*, Jan. 2, 1906, p. 16.) Female, age fifty-five years. Had a left inguinal hernia for four years. This became painful and swollen and reduction was impossible. On examination there was a hernia as large as an egg, the skin was red and oedematous. No vomiting. No distention, though obstipation existed. Operation disclosed a sac filled with fluid and an appendix epiploica. This was adherent by its base to the adjoining intestine which was slightly altered and presented a gangrenous aspect. Removal of the appendix epiploica. Inversion of the gangrenous spot and radical cure. Recovery.

CASE V.—MUSCATELLO. (*Brucheinklemmung der Appendices epipl. und ihre folgen.*, *Münchener med. Woch.*, Sept. 18, 1906.) Female, age fifty-six years. Two days before admission, and without apparent cause she experienced a violent pain in the left groin soon radiating toward the abdomen. No vomiting and bowels moved. Forty hours later she was brought to the hospital with a diagnosis of strangulated femoral hernia. Examination revealed a swelling in the left femoral region, very tender, irreducible and not producing an impulse on coughing. Operation under local anaesthesia revealed a sac containing yellowish fluid and two free bodies. One measured 2 cm. long and the other 1.5 cm. long. They were appendices epiploicæ attached to the sigmoid, by two fine pedicles, no torsion was present. Removal of the appendices epiploicæ, resection of the sac, and radical cure. Recovery.

CASE VI.—MUSCATELLO. (*Ibid.*) Male, age thirty-two years. Six months previous to admission, he experienced a sharp pain in the left groin. The pain disappeared for one month. Then he noticed a small tumor which has gradually increased in size. An examination revealed an inguinal hernia extending into the scrotum. At operation, the omentum was found in the sac, in addition, there was an appendix epiploica, adherent to the posterior part of the neck of the sac and twisted upon itself. The torsion took place about 5 mm. from the insertion of the appendix epiploica on the colon. A second appendix epiploica was adherent 5 mm. below the neck of the sac. Removal of the appendices and radical cure. Recovery.

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CASE VII.—MOHR. (*Brucheinklemmung von App. epipl.*, *Münch. med. Woch.*, 1907, vol. liv, p. 170.) Male, age sixty-two years. He had for the past three or four years a small tumor in the left inguinal region. Tumor reducible. Ten days before admission, the hernia became irreducible. The diagnosis was strangulated hernia and operation performed. In the sac was found, attached to the posterior wall, an appendix epiploica which presented signs of hemorrhagic suffusion. In addition, there were two other appendices epiploicæ which sprang from the sigmoid and which were in a state of torsion with gangrene imminent. Removal of the three appendices epiploicæ and radical cure. Recovery.

CASE VIII.—KRUGER. (*Zur Torsion der App. epipl.*, *ibid.*, 1907, vol. liv, p. 1813.) Male, age fifty-six years. Twenty years ago, he suffered from a pain in the right groin. Two years ago, the pain returned only to disappear in a short while. Three days before admission, he had a third crisis. The pain radiated to the umbilicus. On examination, there was a firm mass in the right inguinal region. Operation disclosed, lying in the sac, an appendix epiploica 4 cm. long and 1.5 cm. thick. It was inserted by a short pedicle to the cæcum which was in the sac. The appendix epiploica was twisted upon itself and it was this torsion which gave rise to the inflammatory symptoms. Removal of the appendix epiploica, and radical cure. Recovery.

CASE IX.—SERVE. (*Isolierte Brucheinklemmung einer Appen. epipl.*, *Deutsch. Militärarzth. Ztschr.* Nov. 1906.) Male. For many years has had a left inguinal hernia, the size of an egg. Two days before admission, he experienced, following a severe muscular effort, a violent pain in the hernia. At the time of admission the scrotum was swollen, the abdomen distended, though the bowels moved. When the sac was opened, a few drops of fluid escaped. The sac contained an appendix epiploica 10 cm. long; it was completely twisted upon itself. Removal of the appendix epiploica and a radical cure. Recovery.

CASE X.—VULLIET. (*Du Rôle des appendices epiploicus dans les accidents herniaires.* *La Semaine Médicale*, No. 27, 1907, p. 316.) Male, age sixty-two years. Has had two small inguinal hernias for twenty years. Three days before admission, he had a pain in the left inguinal region. One day before admission there developed a painful cord-like swelling which gradually increased in size. The sac when opened contained two appendices epiploicæ, quite fatty and not adherent to the sac. The pedicles were thin and extended to the sigmoid which lay immediately above the internal inguinal ring. Removal of the appendices epiploicæ and radical cure. Recovery.

CASE XI.—KENDERJY and SEJOURNET. (*Revue de Chirurgie*, No. 42, 1910, p. 40.) Male, age forty-three years. Presents a painful swelling in the left inguinal region with symptoms of intestinal obstruction. The diagnosis was strangulated hernia. The history was that the patient had had this hernia twelve years. It had never been completely reducible. Incarceration or strangulation had never occurred. The only symptom was a slight pain which would disappear quickly following a rest. Always constipated. Two weeks before admission the patient had a severe pain in the hernia which began to swell. These

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symptoms disappeared with a saline. Two days before admission symptoms of intestinal obstruction were noted. Purgation and enemas were ineffectual. Pain and swelling took place in the hernia. Examination showed a mass in the left inguinal region. The inferior end of the mass entered the scrotum. The skin was inflamed. Tenderness. Incision revealed a cylindrical sac, about 10 cm. long and 6.7 cm. broad. When the sac was opened, some yellow fluid escaped. A yellow mass was found in the sac. This had a fatty aspect and presented ecchymotic areas. The operator thought it was the omentum strangulated. Close inspection and traction on the mass brought into the wound, the intra-abdominal pedicle, which, in turn, was attached to the sigmoid. The torsion was one and one-half times. The pedicle was ligated 5 mm. from the intestine and the appendix epiploica removed. Radical cure. Recovery.

CASE XII.—SMOLER. (*Über einen Fall von intra-abdominales Netztorsion bei gleichzeitiger Brucheinklemmung einer Append. epipl.*) Male, age thirty-seven years. Had for many years a right inguinal hernia, always symptomless. Two days before admission to the hospital he complained of pain in the hernia which had become irreducible. Examination presented a patient in moderate shock. The abdomen was distended and rigid. There was a right inguinal hernia extending into the scrotum. It felt like an omental hernia. Operation: the sac was thickened. Omentum was found discolored with beginning necrosis. To the medial side of the internal ring was a structure, thick as the little finger, 2 cm. long which close inspection revealed as an appendix epiploica. Because of the necrotic condition of the omentum the incision was enlarged and the abdomen opened. This disclosed the condition of torsion of the omentum to the degree of 360. The portion of the omentum in the sac was not adherent, in fact, the point of adhesion was to parietal peritoneum in the region of the internal ring. The appendix epiploica belonged to the sigmoid, which was strongly drawn to the right side. The omentum was removed and the appendix epiploica ligated and removed. Abdominal closure. Radical cure. Death, from heart failure. Autopsy showed chronic nephritis.

CASE XIII.—SCHWEINBURG. (*Ein Fall von isolierter Inkarseration ungestielter Appendices epiploicæ.*) Male, age forty-five years. (*Wiener klin. Woch.*, Dec. 13, 1906, p. 1522.) Has had left inguinal hernia for many years. Always easily reducible. Six days before admission hernia became irreducible during work. No pain or vomiting. Bowels regular until day before admission. Pain then occurred and hernia became tender. Sent to hospital for operation. Examination showed well built man with sound organs. A small painful left inguinal hernia. Tender. Overlying skin not discolored. Abdomen not tender. Palpation of hernia gave sensation of small strings, easily pushed around under the finger. Diagnosis of omental hernia incarcerated. Operation: the sac was thickened, contained only odorless fluid; three masses found, gave impression of appendices epiploicæ. The largest was 4 cm. long,  $1\frac{1}{2}$  cm. broad; the smallest was 2 cm. long,  $\frac{1}{2}$  cm. broad. All were hemorrhagic and thickened. They were pulled down

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and the sigmoid seen which demonstrated the masses were appendices epiploicæ. Removal. Radical cure. Recovery.

CASE XIV.—LINKENFELD. (*Deutsch. Zeitschr. für Chirurgie*, vol. xc, fas. 4-6, 1908, pp. 383-394.) Female, age fifty-seven years. Eight days before admission she noticed a swelling in the right inguinal region. Severe pain; no vomiting; bowels regular. Physical examination showed no abnormalities save a right inguinal hernia. This was tender and dull on percussion. Abdomen soft and not distended. At operation an incarcerated piece of fatty tissue with a smooth surface was found adherent to the sac wall. The adhesion was freed and the fatty mass pulled upon. It showed a superficial creasing. Removal of fatty mass. Found to be an appendix epiploica, probably from the cæcum. Radical cure. Recovery.

CASE XV.—LINKENFELD. (*Ibid.*) Case II, male, aged seventy-one years. Many years had a hernia. Past two weeks, pain, swelling and redness of the skin. No symptoms of obstruction. Taxis failed. Examination: Arteries sclerosed; intermittent pulse. Left side hernia, size of fist. Sensitive. Skin is red. Percussion dull. Abdomen soft, not sensitive. Passes flatus and stool. No vomiting. Operation: (Braun) Sac chronically inflamed. Three appendices epiploicæ found. One thick as finger, other as pencil. All swollen, red and hemorrhagic. Upper end of these were creased. Ligation and removal. Radical cure. Death on second day from acute dilatation of heart. Autopsy, a dissecting aneurism of internal and external iliac arteries. Large retroperitoneal hemorrhage. Appendices epiploicæ of descending colon are greatly enlarged. Two are united at the distal end. So that with intestine they form an opening, through which one could put the index finger. Also found an appendix epiploica discolored, filled with blood. This must have been in the hernial sac and then became incarcerated. The appendices epiploicæ of the sigmoid measured 15 cm.

CASE XVI.—LINKENFELD. (*Ibid.*) Case III, male, age sixty-four years. Very corpulent. For eight days, a swelling in right inguinal region irreducible. Painful. No intestinal disturbance. No vomiting. Bowels regular. Egg size swelling in right inguinal region and scrotum. Consistency hard. Diagnosis, incarcerated omental hernia. Sac opened, had apparently a piece of omentum, adherent and fastened to the wall of the sac. Piece of twisted connective tissue ran into the abdomen. Removal of the so-called omentum. Radical cure. 48 hours later, vomited black-brown mass in which is blood. Vomiting repeated the next day. On the sixth postoperative day, sudden vomiting of pure blood. Blood from bowel. Death. Autopsy. Operation wound is perfect. Blood in stomach and duodenum. Multiple ulcers of stomach. Six large fat and thick appendices epiploicæ on sigmoid. The longest, 14 cm. long. One of the appendices epiploicæ had a stump 1½ cm. long and had a ligature.

## BIBLIOGRAPHY

<sup>1</sup>R. Robinson: *Anatomie et Pathol. des sero-appendices*, Paris, 1908.

<sup>2</sup>Quain's *Anatomy*, vol. ii, Part ii.

## ULTIMATE RESULTS FOLLOWING NEPHROPEXY IN CASES OF SYMPTOMATIC NEPHROPTOSIS\*

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KNOWLEDGE concerning the anatomy of organs obtained at autopsy and in the dissecting room has within recent years led to serious errors in symptomatic deductions made in office or bedside studies. Before Schultze began his investigation of the anatomy of the pelvic organs in living women, the view generally held by anatomists was that the uterus normally occupied a retroposed position. This belief was due to the fact that after death the general relaxation of the supporting ligamentary structures permits the uterus to fall backward. Schultze, through the bimanual method of pelvic examination in a series of normal women, was able to prove the contrary position *in vivo*.

Before Glenard published his epoch-making paper in 1885, autopsy protocols seldom recorded the kidney in any other than a fixed lumbar position. Even with wide range of mobility the kidney after death settles back into its lumbar fossa, and with the congealing of the suprarenal fat the organ is left more or less fixed in articulo mortis, and what was an abnormal position in life becomes a normal one in death. In both instances adherence to classic anatomic standards led to a confusion of theories as to the symptomatic manifestations of these organs, and, as a consequence, both organs have been subjected to gross surgical insults. In every instance in which some form of fixation operation has been devised to fit a certain anatomic pattern these errors have been vividly demonstrated.

From 1890 to 1900, when, through eager but ill-tempered enthusiasm, many surgeons began a most energetic operative propaganda in cases of nephroptosis, too often the chief indication for surgical intervention was the mere presence of a movable kidney in a neurotic woman. Since the majority of women who have movable or floating kidneys are thin-chested, the subjects of enteroptosis, and are poorly developed in many other directions—in other words, are physical defectives from birth—they furnish the worst possible operative risks so far as restoration to a normal standard of health is concerned. Because of this very injudicious selection of cases, in the earlier phases of this work the greatest opprobrium was cast upon all operations for nephroptosis. So long as the anatomic rule was followed and was sustained by a blanket symptomatology covering all possible phases of gastro-intestinal and neurotic disorders, the beneficial result attained was indeed slender, as the final surgical inventory proved. Like the old-fashioned shot-gun prescription, it was potentially harmful oftener than it was beneficial.

It is not surprising, therefore, that many surgeons who from the first

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had been conservatively skeptical became radically antagonistic to any further surgical activity in this field. The effects of such antipodal positions in medicine are usually salutary, for time tends to dampen the ardor of the enthusiast and holds in leash the pseudo-surgeon, while the judicious practitioner, who occupies a position midway between an irrational optimism and a stubborn pessimism, may take stock, as it were, and from a careful balancing of equations usually gathers valuable practical conclusions that are applicable to an occasional case.

In the study of our series of 50 cases the evolutionary limitations of operative indications as our own experience has grown has come from the recognition of our own failures in the neurotic type of women. That vast and prolific domain of neuroses and of gastro-intestinal functional deviations that previously furnished so large a number of cases has of recent years been excluded by all discerning surgeons, for the final demand is that the kidney itself must, through manifest symptoms directly referable to the organ, furnish the indication for an operation. In our series of cases we find that, during the earlier years covering a much smaller clinical service in the University Hospital, the proportionate number of nephropexies was much larger than with the present greatly increased departmental census. This numeric shrinkage during the last seventeen years is indicated by the following figures:

During the years 1900 to 1905 there were 1385 ward admissions; among this number 18 nephropexies occurred; between 1905 and 1910 there were 1765 admissions, with 15 operations; from 1910 to 1915 there were 2422 admissions, with only 17 operations: in other words, the figures show a steady diminution in the percentage of elective cases.

If one adheres to the rule that surgical intervention is indicated only when the kidney or the bladder gives expression to symptoms, the ratio of cures will compare satisfactorily with that following other approved operative procedures. To define our attitude I may say that we have settled upon three cardinal indications for possible surgical intervention in movable or floating kidneys. These are *fixed pain in the renal area, Dietl's crisis, and marked vesical distress referred from the renal area*. Even these symptoms, however clear, must be supplemented and confirmed by a rigid clinical investigation, which should include a cystoscopic examination, catheterization of the ureter on the affected side, and, in the majority of cases, an injection of thorium and an X-ray examination to ascertain the degree of dilatation of the renal pelvis. Any apparent surgical indication not confirmed by these latter diagnostic measures is, in our opinion, open to criticism.

Every possible source of obstruction from lesions of the pelvic organs and from ureteral stricture must be excluded, and when these conditions have been fully complied with and an accurately defined bill of clinical particulars has been established, one is warranted in anticipating, with considerable optimism, a favorable outcome from a properly executed nephropexy.

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In no case is the diagnosis of symptomatic nephroptosis permissible unless a thorough cystoscopic and skiagraphic study of the case has been made. Such a procedure is necessary not only because it affords additional evidence on which to base the diagnosis, but also because it eliminates the possibility of a renal lesion, such as calculus or tuberculosis, or of an ureteral stricture being present, which conditions may produce symptoms closely simulating those of movable kidney.

As a means of corroborating the diagnosis, pyelography has proved a valuable aid. In the more advanced cases of pelvic dilatation retention can be demonstrated by the ureteral catheter, but dependence should not be placed upon this alone, or erroneous conclusions may be the result. The picture of the renal pelvis and ureter shown in the pyelogram affords indisputable evidence, and often furnishes information concerning other lesions that would escape detection by simpler methods of diagnosis. By pyelograph it is possible to demonstrate not only the earliest stages of pelvic dilatation, but also the point of angulation which is often found to exist in the upper portion of the ureter or at the ureteropelvic junction.

My associate, Dr. Floyd E. Keene, who has charge of the cystoscopic investigations in our department at the University Hospital, has until recently used a 10 per cent. collargol solution for the injections, with satisfactory results; more recently, however, he has employed thorium nitrate method, as described by Burns, and has found it superior to collargol in that it gives a clearer picture, is a cleaner medium to work with, and is apparently free from the dangers that have been reported as following the collargol injection. The ureteral catheter is passed into the renal pelvis, and the character of the urinary flow is noted, to determine the presence and the degree of retention. The catheter is then withdrawn for 15 centimetres, and with the patient in the half-sitting posture, the thorium solution is injected slowly by the gravity method. When the solution ceases to flow or the patient experiences the slightest sensation of fullness in the kidney region, the injection should be discontinued and the picture taken. By this limitation of the symptomatology and the accurate checking up of anatomic defects neuroses of all types and cases of gastro-intestinal disturbances are excluded.

The advances made in the surgery of the upper abdomen have in large measure exploded the pelvic reflex fallacies, for it has been amply proved that lesions of the pelvic organs that do not manifest direct symptoms seldom indeed give rise to gastric reflexes. This is true also of gastro-intestinal reflexes of renal origin. Because of the close anatomic relationship between the right kidney, the duodenum, and the pylorus, it is probable that an unduly movable kidney may occasionally be responsible for gastric disturbance. This statement is borne out by the occasional cure of these disorders that follows an operation for nephroptosis with a direct renal symptomatology. On the contrary, however, when the digestive disturbances are the sole symptoms, but few patients are cured by anchorage of a movable kidney. The occasional issue in which the gastric symptoms have been made the

pretext for an operation is so rare, and the record of failures is so frequent, as to strengthen the conviction that such disorders should never, alone, serve as a surgical finger-board merely because a palpable movable kidney is present. By following this policy of absolute limitation we may fail to cure an occasional deserving dyspeptic, but, on the other hand, we will also certainly escape the ridicule and just criticism of the internist or neurologist because of many surgical wrecks in which proper discrimination was not made. For years we have measured the range of the renal mobility in all abdominal sections by slipping the kidney under direct touch to its lowest point of excursus, and we have found repeatedly the most extreme mobility of the right kidney without a single attendant renal or gastric symptom.

Notwithstanding the more rigid selection of cases within recent years, we find, on reviewing the results, that the percentage of cures among the cases traced appears to be about the same. This at first sight is apparently at variance with the belief that a more rigid selective policy will yield better results. We believe that this uniformity of cures in our cases, however, is more apparent than real, and is due to the fact that a large percentage of women whom we have failed to trace were operated upon in the earlier days of our hospital service, when we were less discriminating in our surgical endeavors.

One cause of failure to effect a cure by nephropexy in a symptomatic nephroptosis may occur when there is chronic dilatation of the renal pelvis, with secondary renal changes, such as pyelitis or nephritis, and even though, as the result of the operation the kidney is placed in a better functioning position, the pathologic changes are too far advanced to permit a perfect physiologic restoration to take place.

As to the method of operation, we have found Edebohl's plan, with slight technical modifications, to be the most satisfactory. In our earlier series of cases we employed the Brodel stitch successfully, but we were always under the impression that in sinking a triangular stitch into the renal substance we increased the hazard of an untoward operative result.

In operating according to Edebohl's plan the usual straight dorsal incision is made, and the kidney is reached through the renal triangle, with a minimal amount of injury to the muscular structures. Great care must be exercised to avoid injury or ligation of the lumbar nerves. In one or two instances in our earlier experience this latter accident occurred, and a slow and painful convalescence was the result; in one case this distressing sequel dragged painfully on into months. The perirenal envelope is pulled well up and any redundancy is excised so that when the suspension stitches are applied this tissue also secures the kidney through its hammock-like adjustment. In effecting decapsulation of the kidney we depart from the extensive method of Edebohl. Our right plan is to split the capsule back on a grooved director to each pole of the kidney, but it is only slightly dissected loose from the organ, leaving a narrow band of exposed kidney substance about one-half inch wide. The extent of the decapsulation has thus been limited because experimental investigations and clinical experience have proved that the

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fibrous capsule that reforms after a total decapsulation is frequently the source of serious pathologic changes. Three mattress sutures of silk or linen thread are inserted in the capsule on each side of the exposed dorsal surface of the kidney, and the perirenal fascial hammock, which is pulled up snugly about the kidney, is transfixated. With a long curved needle these sutures are carried through the lumbar wall to the surface and tied over small gauze bolsters. Because of the tension upon these sutures the denuded renal surface is brought up into snug contact with the incision, thus creating a strong bond of fixation between these two surfaces, where adhesions occur. The incision is closed in the usual manner, and at the end of ten days the suspension sutures are removed.

About 50 per cent. of our cases have been examined at intervals varying from one to ten years after the operation, and in no case has a recurrence taken place. In one of our earlier cases in which a nephropexy was attempted by using the Brodel stitch, the hemorrhage from one of the triangular stitches in the kidney was so severe that a nephrectomy was necessary to save the patient's life. This was the only immediate surgical complication of noteworthy importance occurring in this series of cases. One patient died of a pulmonary embolus ten days after operation. From what has been said it will be seen that the dangers of a nephropexy are slight and should not deter the surgeon from undertaking the operation provided his intervention is based upon a valid renal symptomatology.

*Analysis of Fifty Cases of Nephroptosis in which Nephropexy has been Performed.*—In following up the cases which have been operated upon between 1900 and 1915 we have been able to secure full data from 36 of the 50 cases operated upon during this time. Divided into five-year epochs, at first glance it would appear that the percentage of cures is about the same in all three groups regardless of the greater refinement of diagnosis and the more accurate restriction of the symptomatology to actual renal or vesical manifestations in the later series. This conclusion, however, is fallacious, for much the larger proportion of untraced cases falls within the first and second five-year periods than in the last. Thus, in 18 of the first group, only 10 could be located; of the second 15 there were 11, and in the last 17 there were 14. As we review the first and second groups, we observe, first, that the indications for operations were at times at best rather vague, and not infrequently the nephropexy was performed as an incidental part of a combined operation, consisting of various pelvic, appendiceal, and other procedures. Since 1910 the operations have largely been for the correction of a pathologic nephroptosis *per se*, and the only additional operation has been as a rule the coincident removal of an appendix as a matter of precaution rather than of necessity. We may, therefore, attribute a curative ratio of 70 per cent. in this group directly to the kidney suspension rather than to some one of three or four other coincident operations.

In other words, one might say that in our earlier experiences, a nephropexy was thrown in with the pelvic operations on the principle of giving good measure rather than because the kidney was the subject of direct

pathologic manifestations. In several of our earlier cures we may feel reasonably sure that this additional operation did neither harm nor good, whereas in some of our failures we are inclined to feel that the prolonged surgical manipulation in a neurotic individual has done positive harm. We particularly are impressed with this fact in the final summary of results. It is always salutary to review the bad results of our work in order to correct such faults in the future and to lay down fixed rules for a routine procedure applicable to a chosen group of cases.

First, as an example of a surgical error, I would cite Case 810, admitted to the hospital in 1903. The patient's chief symptoms were—sharp pains in both ovarian regions, radiating down the left leg, headache, backache, no renal symptoms. The examination revealed a prolapsed left ovary, prolapsus uteri partialis, lacerated cervix and perineum, and movable right kidney. For these conditions the following operations were performed: Repair of cervix and perineum, suspension of uterus, and right nephorrhaphy. This case could not be traced, but regardless of the result so far as any benefit to the patient's health was concerned, in the light of our present knowledge one may feel assured that no benefit was derived from the additional nephorrhaphy. In other words, this part of our operation was performed to meet an anatomic rather than a pathologic indication. In such an instance if a bad result were to follow, the ill-chosen operation might easily have to bear the burden of a bad recovery. According to our present attitude we view such a procedure as meddlesome surgery much more likely to be provocative of harm than of good.

Our table of earlier cases reveals instances of misapplied surgery, but we believe that errors have been less and less frequent during the last ten years. An operation without a clearly defined indication in a neurotic patient can only result in an untoward issue in the vast majority of cases, and it is for this very reason that we so urgently condemn the application of surgery to any organ unless a pathologic state directly amenable to surgical measures is found.

We shall relate the brief summary of one more case of misapplied operation before passing to our later series which stands upon a more equitable basis. Case 1230, admitted May 9, 1904. Chief symptoms were pain in lower abdomen, especially in inguinal regions and right renal area, increasing weakness, general nervous breakdown, seven or eight years ago. Diagnosis: Bilateral hydrosalpinx and right nephroptosis. The combined operation consisted of a right salpingo-oophorectomy, left salpingectomy, partial left oophorectomy, appendectomy and right nephropexy. Again, in this instance, the patient could not be located, but we do not hesitate to hazard the opinion that whatever the ultimate outcome in this case may have been the nephropexy added no beneficial effect but possibly helped to topple the patient further over into the domain of chronic neurasthenia. We may refer to such cases as markers in the line of surgical progression, teaching the unerring lesson of what not to do.

In the evolution of this phase of surgery these cases stand as

## ULTIMATE RESULTS FOLLOWING NEPHROPEXY

### CASES OF NEPHROPTOSIS OPERATED UPON DURING THE LAST FIVE YEARS

Gynecological number, date of admission	Symptoms	Diagnosis	Operation	Condition on discharge	Result
3462 10-6-10	Constipation, flatulence. Colicky pains in lower abdomen. Lump in right side of abdomen. "Knife-like" pain in kidney. Cannot lie on left side. Nausea when on her feet.	Right hydronephrosis from nephroptosis.	Suspension of right kidney. Appendectomy.	Surgical convalescence satisfactory.	Growing better each day. Doing house-work and gaining strength. Gained 12 pounds. Numbness in right hip. Never sick except occasional headache.
2510 11-2-10	Backache. Frequency and urgency of urination. Pain in side.	Right nephroptosis. Retroflexion of uterus.	Appendectomy. Suspension right kidney and ovary. Coffey suspension.	Surgical convalescence satisfactory.	Greatly improved. Constant desire to void has passed. Pains across back, especially morning, but wears off later in the day. Worse at periods.
3518 11-10-10	Paroxysmal pain left side following pregnancy, relieved by voiding. Mass in left side during attacks.	Movable left kidney.	Suspension left kidney.	Surgical convalescence satisfactory.	Could not be located.
3746 5-20-11	Pain in sacral region. Weakness. Easily tired. Frequency of urination.	Nephroptosis. Peri-appendicitis.	Suspension of kidney. Appendectomy.	Died suddenly from pulmonary embolus 10 days after operation.	
3806 7-3-11	Pain in left kidney, radiating to bladder. Slight haematuria after attacks.	Hydronephrosis, due to aberrant artery. Nephroptosis.	Pyelotomy. Nephropexy.	Surgical convalescence satisfactory.	Complete cure. No urinary trouble except 2 attacks of cystitis. Does not gain in weight.
4130 3-21-12	Attacks of "indigestion." Pain in right iliac fossa. Urinary frequency. Flatulence.	Chronic appendicitis. Movable right kidney.	Appendectomy. Suspension right kidney (Edebohls).	Surgical convalescence satisfactory.	Cured.
4161 4-13-12	Lump in right side since a fall, 1 year ago. Tenderness in both regions.	Right nephroptosis.	Nephropexy.	Surgical convalescence satisfactory.	Cured. Slight oedema of feet since 1 year after operation. Headache at periods.
4308 8-20-12	Haematuria. Pain right side. Nausea. Nervousness. Menorrhagia.	Hæmaturia. Uterine fibroids.	Supravaginal hysterectomy. Suspension right kidney.	Surgical convalescence satisfactory.	Patient better and stronger in every way. Tires easily.
4582 2-12-13	Nausea after meals. Epigastric distress.	Cholelithiasis. Movable kidney.	Nephropexy. Removal of gall-stones.	Surgical convalescence satisfactory.	"Intestinal trouble" and occasionally frequency of urination. More or less nervous due to onset of menopause.
4692 1/2 5-13-13	Pain and soreness in right iliac region and loin. Nausea and vomiting. Frequent urination. Epigastric distress after eating.	Chronic appendicitis. Caecum mobile. Movable right kidney.	Appendectomy. Suspension right kidney.	Pain in kidney region.	One year ago pain left side, lasting 4 weeks, diagnosed congestion of kidney. Last summer attack of pain right side with fever, lasting 12 days, diagnosed gall-stones. Occipital headaches with nausea and vomiting. Nocturia but not as much as before operation. Gained 14 pounds.

## CLARK AND BLOCK

CASES OF NEPHROPTOSIS OPERATED UPON DURING THE LAST FIVE YEARS—*Continued*

Gynecological number, date of admission	Symptoms	Diagnosis	Operation	Condition on discharge	Result
4920 10-17-13	Sharp pain, left costovertebral angle, referred downward and forward; backache; frequency, pain and burning on urination.	Ptosis of left kidney. Perinephritis.	Suspension left kidney. Freeing of adhesions.	Surgical convalescence satisfactory.	Unimproved—says she is in constant pain. Very garrulous concerning multiplicity of symptoms. Extremely neurotic.
5019 12-22-13	Constant pain in lumbar region, radiating downward. Nervousness.	Left hydronephrosis.	Nephropexy.	Backache.	Patient felt better and backache was hardly perceptible until pregnancy 1 year ago. Constant severe headaches during entire pregnancy. Backache worse since confinement. Also constipated, never having a natural movement.
5108 2-12-14	Dragging pain in right side for 2 years, worse when standing.	Right hydronephrosis.	Edebohls nephropexy.	Surgical convalescence satisfactory.	Much improved but at times feels weak. Pain in left side and back. Menstruated twice each month for past 4 months.
5509 11-17-14	Sharp pain right side of pelvis. Frequent desire to urinate. Pain intermittent and involving loin.	Chronic appendicitis. Floating kidney.	Appendectomy. Right nephropexy.	Surgical convalescence satisfactory.	No further sharp attacks of pain, but occasionally pain on bending or twisting. Excellent health generally except somewhat nervous.
5698 2-17-15	Bladder irritability. Pain lower abdomen.	Movable kidney.	Nephropexy.	Surgical convalescence satisfactory.	Marked improvement.
5751 3/4 4-21-15	Lumbar pain right side, 4 years. Indigestion. Dysmenorrhœa.	Movable kidney.	Nephropexy.	Surgical convalescence satisfactory.	Kidney excellent position. Menorrhagia—seat of fibroid. Rectal tenesmus at periods.

milestones or perhaps turning points in our experience and have served a valuable purpose in limiting our endeavors to cases which offer a large percentage of curative possibilities with a minimum probability of untoward results and disastrous nervous sequelæ. All too frequently we find still this same class of individuals being advised by physicians of limited experience to undergo these unnecessary, and therefore harmful operations, and quite as frequently surgeons who are willing to act as aiders and abettors of this unwarranted procedure.

The paramount value of an accurate follow-up system is to detect the great as well as the lesser flaws in surgical work, so that those who follow may not fall into similar error. From our observations the one chief warning is clearly apparent—a nephropexy in a neurotic woman, unless the renal symptomatology is clearly defined, cannot be deprecated too urgently.

In concluding, we append a table of cases operated upon since 1910, the period during which we have endeavored to select only those of a true pathologic nephroptosis. A summary of symptoms with diagnosis,

## ULTIMATE RESULTS FOLLOWING NEPHROPEXY

operation, and ultimate results is given. While the results are by no means perfect, they nevertheless present a 70 per cent. restoration to active efficiency of the women operated upon, a degree of restoration which compares favorably with many other operations generally accepted by representative surgeons.

*Conclusions.*—1. The kidney, particularly the right, is not a fixed organ, and even an excessive range of mobility is no certain index of a reflex gastric or nervous disability unless direct renal symptoms referable to the kidney itself are present.

2. The three cardinal symptoms of disturbed renal function are pain in the renal area; a urinary or Dietl's crisis, due to kinking of the ureter; or vesical irritability directly referable to the kidney of the affected side.

3. No diagnosis should rest solely upon palpation of even an unduly movable kidney or upon a definite symptomatology unless this is confirmed by a cystoscopic examination, catheterization of the ureters, and a pyelograph to define the point of kinking in the ureter and the degree of dilatation of the renal pelvis.

4. With this rigid method of exclusion and clear symptomatic definition the surgeon may confidently count upon securing 70 per cent. of cures and from 10 to 15 per cent. of improvements as the result of the operation.

5. The dangers arising from the injection of radiographic substances into the renal pelvis are great if piston or excessive gravity pressure is employed during the injection. With slight gravity pressure no untoward symptom has been observed in our series of cases.

6. In our hands, the Edebohls method, with slight modification, has proved satisfactory as a permanent means of anchorage.

## CONGENITAL ELEVATION OF THE SCAPULA

(SPRENGEL'S DEFORMITY)

BY JOHN FAIRBAIRN BINNIE, C.M.

OF KANSAS CITY, MO.

BRADFORD and Lovett (*Orthopedic Surgery*, 3d ed., p. 391) write: "This condition is a somewhat unusual congenital deformity in which one scapula is raised in its relation to the thorax and clavicle and also to the opposite scapula. The scapula is not only raised, but generally so rotated that its lower angle approaches the spine. Scoliosis is likely to exist in connection with it, and in some cases asymmetry of the face and skull has been noted; the affection is rarely bilateral. One or more of the scapular muscles may be absent and bony anomalies are frequent. In one class of cases a bridge of bone connects the scapula and the vertebral column; in another class there is a long piece of bone projecting upward from the superior border of the scapula but not articulating with or attached to the vertebræ. In other cases there is no bony outgrowth and no deficiency of muscles. In some cases the projecting upper border of the scapula is so noticeable in its elevated position that it is mistaken for an exostosis." The foregoing may be taken as the type of description of Sprengel's deformity given in works on orthopedic surgery and as a correct representation of the usual conditions encountered.

One of the most complete dissertations on Sprengel's deformity is the thesis of A. T. Horwitz (*Am. Jour. Orthop. Surg.*, November, 1908). Horwitz finds that 25 per cent. (34 cases) show a bony, fibrous, or cartilaginous attachment of the scapula to the vertebral column. Twenty-seven of these were bony. This usually runs from the superior median angle or the upper third of the median border to the transverse process of a cervical (fourth to seventh) vertebra. The osseous union is usually by means of a triangular-shaped bone whose base rests upon the scapula and whose apex upon the transverse process of the vertebra. Its union is either by means of cartilage at one or both ends or by direct bony growth without cartilaginous intervention.

Many theories have been advanced regarding the etiology of the accessory bone. Some (Rager) think the presence of the bone a mere accident in the deformity, others think the bony growth primary.

Fairbank (*British Jour. Surg.*, i, 570) summarizes a series of 18 cases of congenital elevation of the scapula as follows:

"The sex of 8 was male, of 10 female. The right scapula was affected in 6 cases, the left in 9, while in 3 the deformity was bilateral. The scapula was anchored to the spine in 7 cases: in 2 of these, both scapulae were fixed, in one by a bridge of bone on both sides, and in the other by bone on the right and fibrous tissue on the left. Scoliosis was present in 10. In at least 4 a wedge-shaped half-vertebra was present. In one of these, at the age

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of two years, there was no curve, but by six years a low dorsal curve toward or rather below the elevated scapula, and quite unconnected with the half-vertebra, had developed. In 5 the dorsal convexity was directed toward the raised shoulder, in 4 away from it, while in 1 case with an abrupt curve both scapulae were elevated.

“Partial fusion of ribs was seen in 7 cases, one of these being open to doubt. An unmistakable cervical rib was present in 2 cases only. In 2 there was total suppression of one or more vertebrae, while in 4 cases, including the two just mentioned, there was present a half- or wedge-shaped vertebra. In 3 other cases the shortness of the neck made suppression of vertebrae more than probable, but the difficulties encountered in taking radiograms prevented a definite decision being arrived at. In 2 cases a projection or exostosis was present at the vertebral border of the scapula.

“With regard to other deformities present, 3 cases displayed torticollis, 2 of them having both scapulae elevated. The radius was absent in 1, the pectoral muscles were imperfect in 2, and facial asymmetry was noted in 2, only one of which was associated with torticollis.”

Walsham and Willet, quoted by Horwitz (I am using Horwitz's paper very freely), promulgate three hypotheses.

1. That the bone was formed in connection with the vertebrae and afterward became ankylosed to the scapula.
2. That it was primarily scapular and later became fused to the spine.
3. That it was found independently both of spine and scapula.

These authors support their second hypothesis opining that the bridge of bone is an “abnormal development of the suprascapular epiphysis, which normally exists as a narrow bridge of bone along the posterior border of the scapula, and consequently as homologous to the suprascapular bone of some of the lower vertebrates” (e.g., the frog). Minot thinks the scapula, as other structures, is developed in a sheet. This sheet is continuous with that of the vertebrae, and centres of ossification appearing between the two points, a continuous band of bone is formed. Horwitz naturally tends to Minot's views and writes, “A suprascapula, if we regard this overgrowth as such, would extend from the lower portion of the scapula, whereas this extends from the upper third, with a broad base of attachment.” Some of the theories as to the causation of Sprengel's deformity are:

1. Intra-uterine pressure from lack of amniotic fluid (Sprengel, Bradford, etc.).
2. Malformation of scapula part of a general maldevelopment (Kirmisson).
3. Schlange. Arrest of development due to amniotic adhesions.
4. Exostoses and muscle contractions due to periostitis (Eulenberg).
5. The scapula is developed at a higher level than it maintains at birth. Retention of the fetal position is the cause of the deformity according to Chievitz.
6. Injury at time of birth as has been demonstrated in torticollis (Gold-

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thwait). Contraction of sternomastoid (Kayser); defective rhomboids (Lameris); defective pectorals (Schlessinger); defective trapezius (Kausch).

Horwitz accepts the theory of Rabel that the deformity is due to defective descent of the scapula.

The case which is here reported presents some marked peculiarities.

M. T., aged four years.

September 7, 1911: Two years ago fell out of bed; was found lying on her back. A physician diagnosed fracture of the clavicle. Her parents, unusually intelligent and watchful, had noted no peculiarities in her shoulder before the accident.

At present patient suffers no pain but cannot raise the scapula. A flat bony tumor reaches from the inner edge of the left scapula along the rhomboids to the spine and almost, if not quite, to the occiput, causing visible deformity. The mass is firmly attached to the scapula, its upper edge is sharply defined on palpation, and can be grasped between the fingers.

The scapular spine is much more vertical than is its fellow, the inferior angle of the scapula is displaced inward and upward. The clavicle is intact. Arm motion is normal. The shoulder action is very defective, owing to the scapular immobility and deformity.

X-ray shows the mass of bone separated by a clear line from the scapula (Fig. 1).

On operation the upper part of the trapezius was split, exposing a flat bone united to the vertebral edge of the scapula by a layer of cartilage one-fourth inch wide. The bone lay in a fibrous membrane identical with the periosteum. The bone reached to near the occiput and one rounded corner of it extended just beyond the middle line of the back. The bone and its cartilaginous connection with the scapula were excised as also the periosteum (Fig. 2). The periosteum was sutured over the raw edge of the scapula. (According to Quain the rhomboideus minor rises from the seventh cervical and first dorsal spines and the ligamentum nuchæ, to be inserted into the base of the scapula opposite the triangular surface at the commencement of the spine. The rhomboideus major lies immediately below, being inserted into the vertebral edge of the scapula between the spine and angle. Variations, however, occur, *e.g.*, "an additional muscle has been observed running close and parallel to the upper border of the minor from the scapula to the occipital bone, and has been called the rhomboideus occipitalis after a similar muscle occurring in some animals.")

The wound healed satisfactorily, but by March 16, 1912, there was recurrence of the trouble.

April 4, 1912: There is a new formation of bone arising from the vertebral border of the scapula from its spine to its inferior angle and reaching to a point about one inch to the opposite side of the vertebræ. This bone is in two pieces, both firmly attached to the scapula by cartilage (Fig. 3). This bone was excised along with the muscle in which it lay. Periosteum was sutured over the cut edge of the scapula. Another mass of bone (Fig. 3)  $1\frac{1}{2}$  inches long by  $\frac{1}{2}$ - $\frac{1}{2}$ , lay parallel

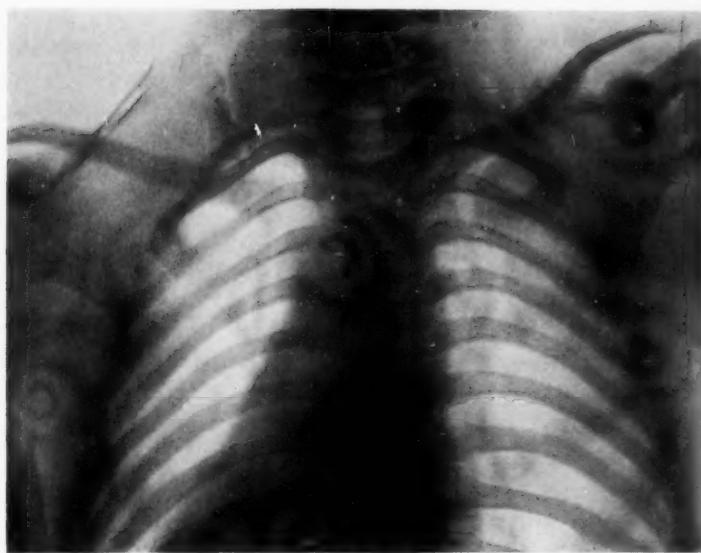


FIG. 1.



FIG. 2.



## CONGENITAL ELEVATION OF THE SCAPULA

and close to the spines of the vertebrae on the left side, but not attached to the bone lying in the rhomboideus major. This was also excised. A bony prominence was noted arising from about the angle of the first and second ribs, but this was not removed, as the patient was not taking the anæsthetic satisfactorily.

July 26, 1912: Almost perfect motion reported.

February 12, 1913: There is a prominence of the scapula on the left side anteriorly above the clavicle and nearly directly above the coracoid. The left shoulder droops and thus prevents complete abduction, otherwise shoulder motion is good. There is no recurrence of the bony neoplasm.

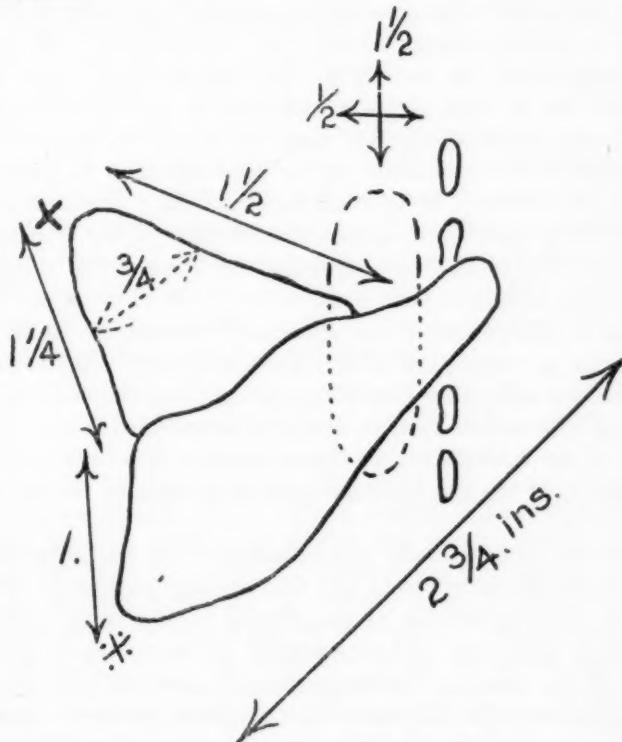


FIG. 3.—Diagram of bones removed at second operation. X, opposite spine scap. \*, opposite angle scap.

This case, so far as concerns the osseous new formations, corresponds closely if not precisely to cases of myositis ossificans, but it also corresponds to Sprengel's deformity. In view of the recurrence of the bony neoplasm after thorough removal one is led to the belief that the neoplasm is not congenital and not dependent upon Sprengel's deformity, but that the Sprengel deformity, *i.e.*, elevation of the scapula, may in some instances be dependent on the bony new formation.

The recurrent mass had wider attachments than the primary and involved fresh muscle. Also, there was the mass in the erector spinae muscles which did not correspond with the typical findings in Sprengel's deformity.

## A NEW METHOD OF EXCISING THE HEAD OF THE HUMERUS\*

By T. TURNER THOMAS  
OF PHILADELPHIA

THE purpose of this paper is not to discuss the general subject of excisions of the shoulder-joint, but to report briefly what is believed to be a new operation and to report two cases on which it was done. By the operation which seems to be generally taught the upper end of the humerus is removed a variable distance below the tuberosities. All four of the rotator tendons, those of the supra- and infraspinatus, teres minor and subscapularis, are divided at their attachments to the tuberosities, their bony attachments removed and the long tendon of the biceps is dissected out of its groove in the humerus, to be later returned to what is left of this groove. The removal of so much bone and the detachment of so many important muscles lead to a serious disturbance of the function of the shoulder-joint, often to that very crippling condition, a flail shoulder. The operation offered here was performed on one case of recurrent dislocation of the shoulder and on one of old unreduced dislocation. It is, therefore, considered only in connection with these conditions. Any value it may have in connection with other conditions calling for excision of the shoulder-joint, such as tuberculous disease, must be determined later. It does not disturb any of the muscles except the subscapularis, which is divided, but later is reunited. Only the cartilage-covered portion of the humeral head is removed.

It is probably not generally appreciated that in the common anterior dislocation of the shoulder, recent and old, the only portion of the humerus protruding in front or outside of the glenoid cavity, is that covered with cartilage and not all of that. I have operated on between thirty and forty old dislocations of the shoulder, recurrent and old unreduced, in which I have nearly always found when I looked for it a typical groove of varying depth in the posterior part of the cartilage-covered portion of the humeral head. This resulted from the pressure against it of the anterior margin of the glenoid cavity, and the constancy of its presence and its situation shows just how much of the humeral head projects in front of the glenoid cavity in the ordinary dislocation of this joint. This groove corresponds to the site of contact between the two bones in the ordinary cadaver dislocation of this joint produced by hyperabduction. The removal, therefore, of the cartilage-covered portion of the head by sawing through at the anatomical neck will prevent recurrences of the dislocation, because it removes the only portion which can be dislocated, while it does not disturb any of the muscle attachments except that of the subscapularis which reunites closely later.

\* Read before the Philadelphia Academy of Surgery, April 2, 1917.

## EXCISING THE HEAD OF THE HUMERUS

In the old unreduced dislocation this operation removes the bony obstruction to the ascent of the remaining portion of the humerus to its normal level just below the acromion process. But this ascent following the operation in my case was incomplete, probably because of the resistance of the surrounding soft structures which had grown into their abnormal position around the long dislocated head. It did, however, remove the bony resistance to movement, so that with increasing movement of the joint and use of this movement it is not unlikely that the humerus will later slowly work its way almost if not quite up to its normal level. In any case the result should be a better one than after removal of the humerus down to the surgical neck as in the usual excision of the shoulder. One can exclude the possibility of flail shoulder, but limitation of movement will be marked unless vigorous exercises are maintained for a long time afterwards. Very little effort was made in either of my two cases to obtain movement, in the epileptic because he did not greatly need it and because he would or could not keep up the exercises. In the other patient the hand of the affected side was helpless for the carrying out of the necessary exercises because he could not grasp anything with it. The degree of movement obtained in the first case, practically without effort, indicates that much better movement could have been obtained in a man who was determined to get it. The second patient was such a man but was crippled with an almost useless hand.

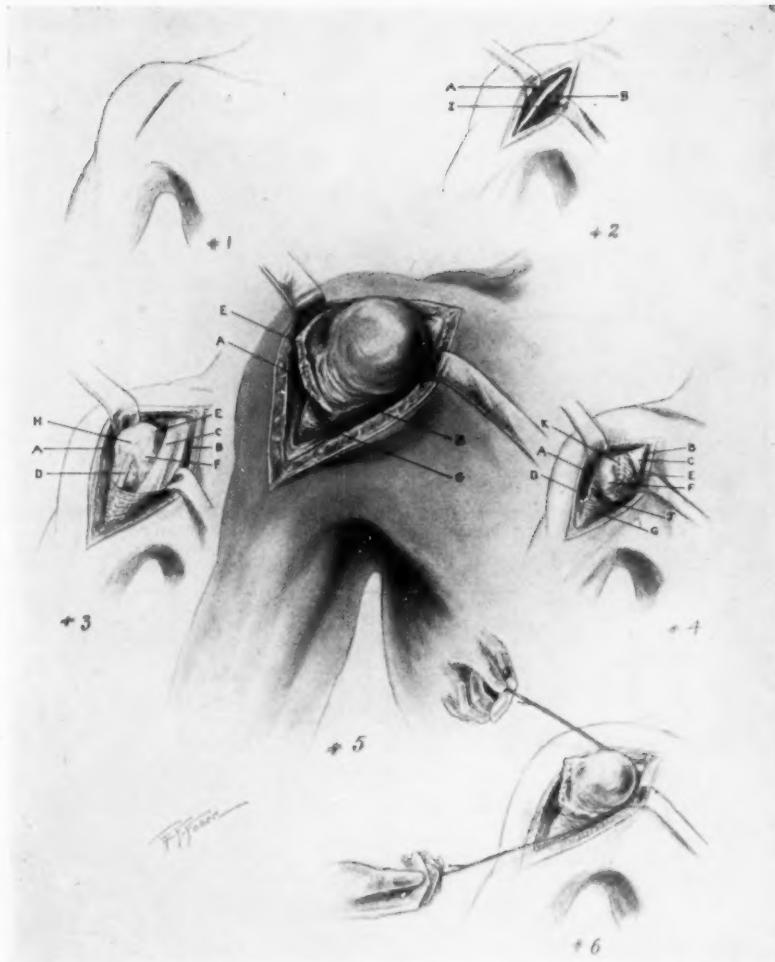
CASE I.—Man, 26 years old, epileptic. Admitted to the Philadelphia General Hospital and the capsule operation for recurrent dislocation was done by myself, January 10, 1914. The dislocation recurred March 24, 1915, during an epileptic attack. He is a large and very powerful man and during such an attack it is said by the physicians who have been in charge that five or six men are necessary to hold him in order that he does no damage to himself or anybody else. During the fourteen months following the operation he had many convulsions without a dislocation. Soon after the operation he was removed to the insane department where he has remained since. I did a second capsule operation, September 20, 1915, and recurrence of the dislocation followed this on April 24, 1916, eight months later. In view of his great strength and violent convulsions and his failing mentality, because of which he will never be called upon to earn his living, it was considered advisable to excise the head of the humerus. This was done before the Clinical Congress of Surgeons, October 28, 1916, as follows:

The usual incision for excision of this joint was employed, *i.e.*, one about six inches long between the deltoid and pectoralis major from just above the coracoid process downward. After retracting the margins of the wound and exposing the upper end of the humerus the bicipital groove was located by palpation. The bony prominence in front of it is the lesser tuberosity and marks the insertion of the subscapularis. This tendon was divided parallel with the bicipital groove and about a half inch in front of or internal to it. This opened the

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shoulder-joint and permitted external rotation beyond the normal limit. This tends to turn the humeral head out of the wound, the degree to which this can be accomplished depending upon the extent of the division of the subscapularis tendon and underlying capsule upward and downward. That shown in Fig. 5 was obtained in the cadaver but not in operation on my patient. Enough was obtained in both cases, however, to make passing of the Gigli saw around the head at the anatomical neck comparatively easy, so that no difficulty was experienced in removing the head. In both, strong external rotation tended to tear the attachment of the capsule and tendon, after the cutting had been carried as far as could be seen, and thus to increase the external rotation and turning out of the head. The internal rotation of the Velpeau position, in which the limb was afterward dressed, brought the cut margins of the subscapularis tendon together without sutures, which may be used if desired. The skin wound was closed by plain catgut without drainage. The patient has had no dislocations since the operation although he has had many of his usual powerful epileptic convulsions. He seems to have full use of the limb except for the limitation of movement shown in Fig. 7.

CASE II.—Well-nourished, heavily-built man, 64 years old, fell down a flight of stairs on July 15, 1915, sustaining a painful injury of the left shoulder. He went to work on the following day, but his hand became so numb that he was compelled to give it up and come home. The hand felt as if it was "asleep". The whole limb has been very helpless ever since. A dislocation of the shoulder was not discovered for some time after the accident and then it could not be reduced. He was admitted to the University Hospital, May 24, 1916, and I attempted reduction without operation, unsuccessfully. He refused another attempt by operation at this time, but returned to the hospital in the following November for this purpose. The middle finger and the terminal phalanx of the ring finger of the affected hand, had been amputated years ago, but the remaining fingers had good movement and perfect function. Since the injury to the shoulder, these fingers and the thumb have been useless because of stiffness and atrophy which involve the whole hand as well. The patient wears a glove on this hand constantly because of numbness and coldness in it. Operation was done November 10, 1916. After exposure of the dislocated humeral head by the same incision as in the preceding case, the subscapularis was located and divided in essentially the same way. Many attempts were then made to pull or pry the head into the socket, with the aid of retractors for pulling and chisels to lever the head in, but without success. Then after some effort the head was rotated out of the wound as in the preceding case and a similar portion removed by the Gigli saw. It was more difficult to rotate the head out than in Case I, but with a little persistence in careful cutting of the capsule and tendon above and below, especially below, where the circumflex vessels had to be avoided, with strong rotation on the forearm to tear what could not be divided, enough exposure of the head was obtained to permit the passing of the wire saw around the anatomical neck



FIGS. 1-6.—*A*, deltoid; *B*, pectoralis major; *C*, short head of biceps and coracobrachialis; *D*, long head of biceps; *E*, subscapularis; *F*, lesser tuberosity; *G*, tendon of pectoralis major; *H*, greater tuberosity; *I*, cephalic vein; *J*, anterior circumflex vessels; *K*, line of division of subscapularis and capsule. 1, skin incision; 2, cephalic vein in interval between deltoid and pectoralis major; 3, upper end of humerus exposed in almost full internal rotation; 4, humerus in full normal external rotation, dotted line indicates where subscapularis and underlying capsule are divided into joint; 5, division of subscapularis and capsule permitted abnormal external rotation and turning of humeral head out of wound; 6, application of Gigli saw.

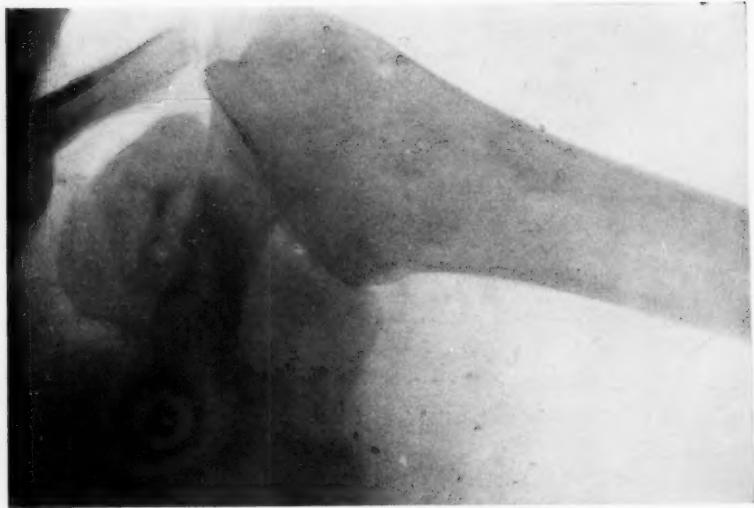


FIG. 7.—Case I. Right shoulder after operation with arm in partial abduction and external rotation. Line of excision could not be shown with arm at side and in internal rotation.

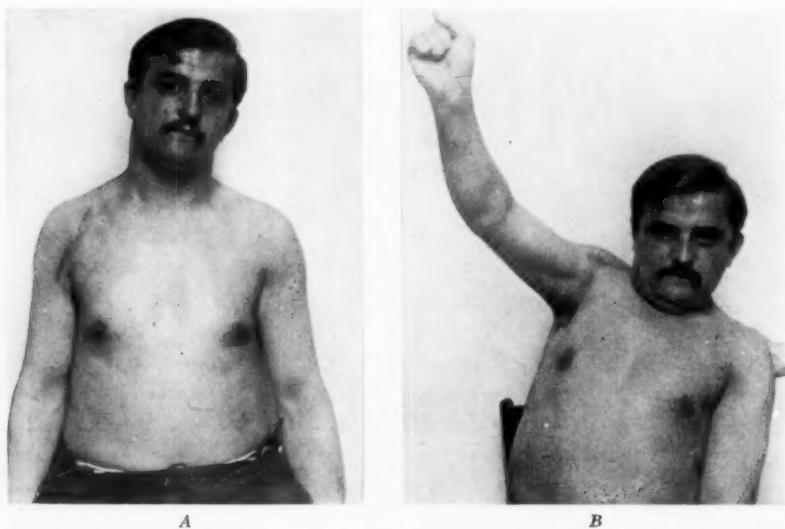


FIG. 8.—Case I. A, showing nearly normal contour of right shoulder after operation. B, showing degree of abduction now possible.

#### EXCISING THE HEAD OF THE HUMERUS

and then the working of the saw through the bone. No effort was made to force the head upward and backward to its normal level except by forcing the arm into full Velpeau position, and fixing it there. A small drainage opening was made into the axilla and a rubber tube introduced. There was no infection, but a haematoma developed in the inner part of the wound and was drained. The patient was discharged December 16, 1916, with a small sinus persisting. To-day, April 2, 1917, the tuberosities of the humerus operated on, on inspection and palpation, appear to have returned almost to their normal height under the acromion. Abduction can be corrected to a right angle with the body. External rotation is limited. The patient says the arm has been much more useful and comfortable "since the shoulder is back in place." The movements of the fingers, while still very limited, have shown distinct improvement since the operation.

## FUNGOUS DISEASES OF THE FOOT, OR MADURA FOOT, IN AMERICA\*

BY RANDOLPH WINSLOW, M.D.  
OF BALTIMORE, MD.

MADURA FOOT, or mycetoma, is a disease that has been known for many years as being endemic in certain localities in India, and as occurring occasionally in other parts of the world. A few cases also have been observed in America. This fungus disease is due to several varieties of vegetable growths, usually of the streptothrix family.

It occurs in three forms, the white or yellowish, the black, and the pink or red varieties. These varieties are so classified from the appearance of certain grains or particles that escape with the discharges from the sinuses that are found in the affected part. The most common form is the white or ochroid, next in frequency is the black or melanoid, and least frequent is the red or pink variety. The ochroid or white form of the disease when examined under the microscope shows fungi that resemble very closely the actinomycetes, and it is probable that some, at least, of the reported cases are due to the ray fungus. In some of these cases, however, the granules resemble fish roe in appearance and are probably not due to the ray fungus. The granules from the melanoid or black differ very materially in appearance and characteristics from those of the ochroid form, being black in color like grains of gunpowder, and hard and resistant to pressure, while those from the ochroid variety are light in color, soft and easily crushed. Vincent succeeded in cultivating the fungus from a case of the white variety, and Wright was able to reproduce black masses from a case of the melanoid variety. From the observations of Wright and others it is evident that the ochroid and melanoid forms of the disease are not due to the same fungus or organism; the ochroid variety being due to a streptothrix, while the melanoid form is due to a more highly organized fungus or hyphomycete.

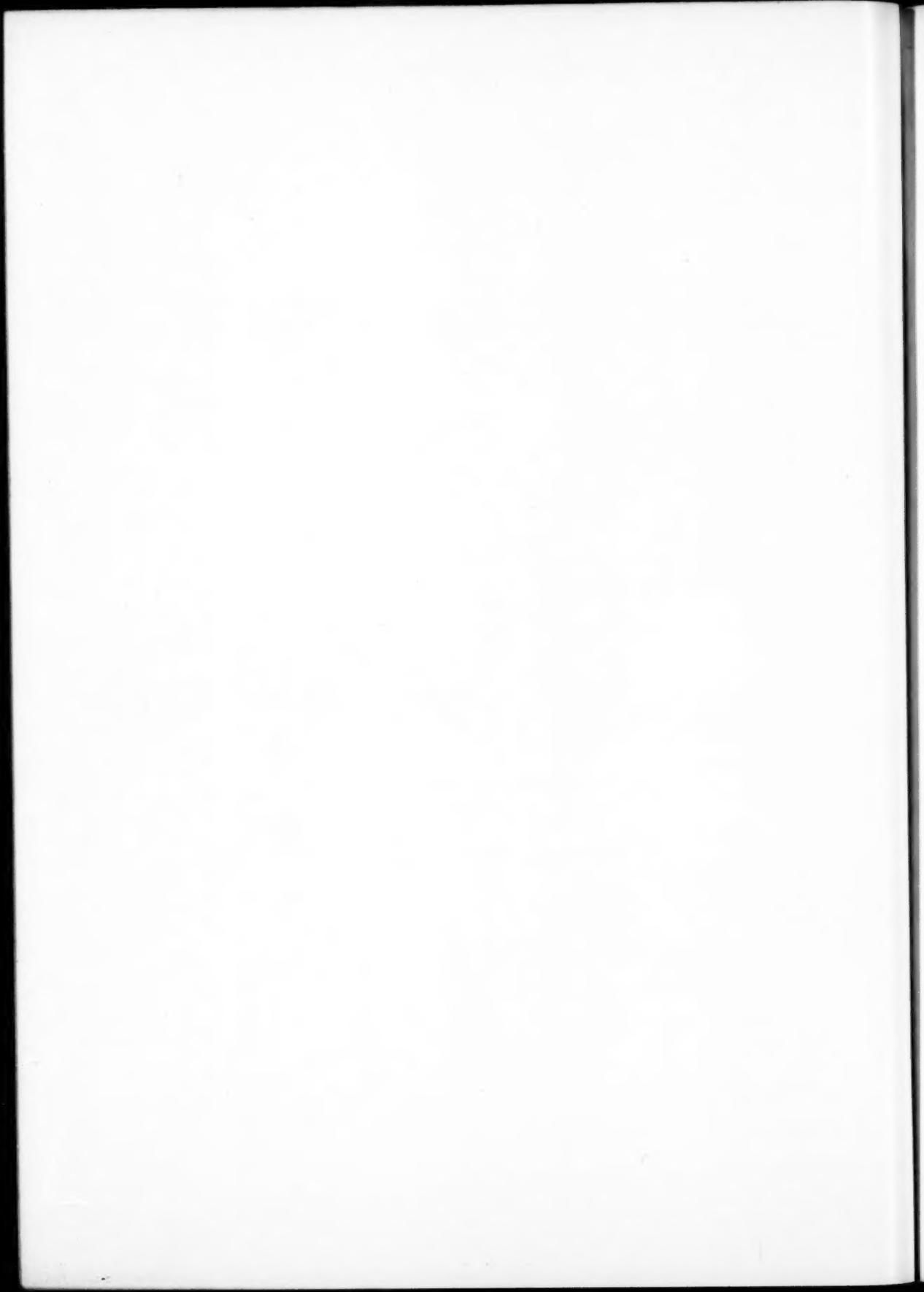
Clinically mycetoma is a chronic inflammatory condition, usually, but not invariably, affecting the tissues of the foot, in which the foot becomes much enlarged, with nodular masses that break down and form sinuses, from which a thin purulent fluid escapes. In this discharge are seen pale or black bodies which when examined microscopically reveal the nature of the affection.

As the disease occurs generally in tropical or subtropical countries, where the people are accustomed to go barefooted, there is often a history of some injury of the foot, such as the penetration of a thorn or splinter. The disease therefore usually begins on the sole of the foot as a small swelling, painless at first, but, as the condition progresses, becoming painful and interfering with locomotion. As the infection extends other nodules form and suppurate and cause fistulous tracts which open externally.

\* Read before the American Surgical Association, June 2, 1917.



FIG. 1.—Actinomycosis of foot—"Madura foot."



## MADURA FOOT IN AMERICA

Eventually the whole foot becomes much swollen, with a brawny, nodular induration, and with numerous fistulae discharging a thin sero-pus containing the characteristic granules. The motions of the foot seem to be limited more by the inflammatory swelling of the soft parts than by destructive lesions of the bones, though a rarefying osteitis of the bones of the foot is also present. The disease never heals spontaneously but progresses slowly, without causing marked cachexia. Eventually however, it terminates fatally unless arrested by appropriate treatment.

The conditions for which mycetoma is most likely to be mistaken are tuberculosis and sarcoma. From the former it should be discriminated by its nodular masses and brawny infiltration and its absence of fever, from sarcoma by its chronicity, its hardness and the discharging sinuses, and from both by the characteristic granules found in the discharge from the fistulous tracts. It has also been mistaken for elephantiasis but its comparatively limited area and numerous sinuses should be sufficient to distinguish it from that affection.

As medical treatment is of no avail amputation above the seat of the disease is the only remedy.

Up to the present time only seven cases of mycetoma have been reported in the United States and Canada, six of these cases were of the ochroid form and only one of the melanoid. Three of these cases occurred in Mexicans living in Texas, one in a French Canadian who had always lived in Canada, one in a young man born in Iowa and one in a young woman living in Kansas. J. Homer Wright, of Boston, observed the only case of the black variety that has been reported in this country, which occurred in an Italian woman who had lived in America several years. From this case he succeeded in making cultures and in reproducing black sclerotia.

As a contribution to the literature of the subject I desire to place on record the following case of fungous disease of the foot, which clinically corresponds with the cases reported as examples of the ochroid form of madura foot.

On December 8, 1900, Wm. Johnson, colored, from Easton, Maryland, entered University Hospital, Baltimore, to be treated for an affection of the left foot and ankle and gave the following history. He is 29 years of age, unmarried, and works on a farm. His family history is unimportant. He has had measles but does not remember having had any other acute sickness. He had had gonorrhœa twice, and six years ago had a sore on his penis, followed by an eruption over his body with alopecia and pain in the limbs. He also has had a suppurating right inguinal adenitis. He uses alcohol in moderation, and both chews and smokes tobacco. About three years ago, while working on a farm, he cut his left foot with an ax. The wound was situated on the inner side of the instep, and was one inch in length and half an inch in depth. At the time of the injury he was wearing a pair of shoes that were covered with manure from the horse stables. He treated the wound himself for a while but, as it continued to get worse, he consulted a physician and it soon healed. About two

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months later an abscess formed at some distance from the original wound, which opened and gave exit to a foul pus. This abscess healed and he had no further trouble until the next summer, when another gathering about as large as a silver dollar formed, which he opened with a razor letting out considerable pus. This sore never healed entirely but he continued working on the farm, ploughing and attending to horses. He did not have any pain in the foot except when he wore tight shoes. In January 1900, the foot began to swell and the joints became very stiff and a good deal of pain was felt. In February he had two sick horses under his care, both of which died. One horse had a lump under its jaw. He also cared for a sick cow in April, which likewise died. He had a sore on his foot while he was attending the sick animals but was wearing boots at the time, although he was accustomed to go barefooted when the weather was warm.

There were no other animals sick on the place where he worked, but on an adjoining farm three horses died, which he visited twice and administered medicine to. The man's symptoms increased in severity, the foot became greatly enlarged, and locomotion gradually became impossible. He entered the Maryland General Hospital in July and was advised to have the foot amputated. To which he would not consent. He, therefore, returned to his home, where he continued to get worse until he entered University Hospital in December.

On admission there was an extensive brawny swelling of the left foot, extending from the tarsometatarsal junction to above the ankle and involving the whole circumference of the foot. The skin was much indurated, and a very thin pus containing yellow particles exuded from, or could be pressed from, numerous sinuses upon the surface of the foot. A probe introduced into these sinuses did not penetrate deeply into the tissues. The motions of the foot were impaired but not obliterated, and he could impart some motion voluntarily. It appeared as if the lack of free motion was due to infiltration of the soft parts rather than to disease of the bones. No pain was felt when he kept still but when he bore weight on the foot it became painful. The glands in the groin were somewhat enlarged but not greatly so. The limb above the foot was thin but not markedly atrophied. His organs were healthy and temperature chart practically normal, as was also the urine. An examination of his blood showed leucocytes 11,800, red cells 4,400,000, haemoglobin 80 per cent. and a slight eosinophilia.

An examination of the granules from the sinuses revealed actinomycetes in abundance, but no effort was made to differentiate the special type of streptothrix present. An amputation in the middle of the leg was performed and he made a speedy recovery.

### BIBLIOGRAPHY

Adami and Kirkpatrick: *Trans. Assoc. American Physicians*, 1895.  
Hyde, Senn and Bishop: *Journal Cutaneous and Genito-urinary Diseases*, vol. xlv, 1, 1896.  
Pope and Lamb: *New York Medical Journal*, Sept. 19, 1896.  
Wright and Beach: *Trans. Assoc. American Physicians*, 1896.  
Arwine and Lamb: *American Journal Med. Sciences*, vol. 118, p. 393.  
R. L. Sutton: *Journal American Med. Asso.*, vol. 60, p. 1339.

TRANSACTIONS  
OF THE  
PHILADELPHIA ACADEMY OF SURGERY

*Stated Meeting, held April 2, 1917*

The President, DR. CHARLES H. FRAZIER, in the Chair

RESULT OF TREPHINING FOR COMPOUND FRACTURE OF  
FRONTAL BONE

DR. P. G. SKILLERN, JR., presented a man, aged thirty-five years, who was admitted to the Polyclinic Hospital, service of Professor G. P. Müller, on January 18, 1917, at 12.01 A.M., and was discharged cured on January 27, 1917. Shortly before admission to hospital he was attacked by a man who struck him a blow upon the right side of the forehead with an ordinary hatchet. When admitted the patient was perfectly conscious and talkative, but somewhat under the influence of liquor. Physical examination revealed a vertical wound on right side of forehead three-quarters inch from median line and with its lower angle at the supra-orbital eminence, whence it extended upward one and one-quarter inches. Beneath the cut scalp edges the skull was laid open, the outer edge projecting forward, while the inner was depressed. Pulsations of the underlying dura were plainly visible. Dark blood flowed from the wound. Under ether anæsthesia and iodine preparation the wound was enlarged downward to the orbital margin, revealing extension of the line of fracture below the limits of the trauma wound. The outer table was bitten away with rongeur forceps, revealing more extensive splintering of the vitreous than of the outer lamina of the skull. Adjoining the deep margin of the hatchet cut these splintered vitreous fragments were depressed upon the dura, which was not, however, lacerated. To gain more room a horizontal incision was added, beginning at the lower angle of the vertical incision and extending two inches outward just above orbital margin and parallel with it. The fracture in its lower portion had opened the frontal sinus. All splinters of vitreous were removed. While withdrawing a splinter from the inner side of wound bleeding arose from the superior sagittal sinus, which was controlled by two strips of iodoform gauze packing, to prevent infection of meninges from nose. There was now a gap in the skull with rounded, even margins; the dura was still unopened. Over this gap the scalp was sutured lightly. Dr. Skillern remarked that this case emphasized the importance of performing exploratory operations upon skull injuries. This patient when admitted was conscious and talkative in spite of the gaping wound made by the hatchet, and there was but a moderate amount of bleeding from the wound; yet the vitreous table was extensively shattered and depressed upon the dura. One of these vitreous splinters had penetrated the wall of the superior sagittal

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sinus; it plugged the hole it had made in the sinus, as was shown by the profuse hemorrhage ensuing upon its removal under gentle manipulation. The opening of the frontal sinus developed a source of infection from the nasal cavity to the meninges. The advantages of the operation, therefore, were that it revealed the extent of injury, permitted relief from the pressure of the inner table upon the dura, prevented secondary hemorrhage from spontaneous dislodgement of the splinter which plugged the sagittal sinus, and facilitated disinfection of the frontal air space, which, although not harboring bacteria when not diseased, yet at operation must be considered diseased until proven healthy, and which, even when healthy, for a path for the transmission of infection from the nasal chamber to the meninges.

### INTUSSUSCEPTION IN AN INFANT : RESECTION : RECOVERY

DR. JOHN H. JOPSON presented an infant, aged seven months, who was admitted to the Children's Hospital May 12, 1916, being referred by Dr. A. G. Mitchell, with a diagnosis of intussusception. He was breast fed up until three months of age and then bottle fed on cow's milk mixture. He was well until thirty-six hours before admission, when after a bowel movement he developed colic followed by vomiting, and had continued to vomit everything taken, including milk, water and barley water. The vomitus was expelled with considerable force and was at first green and later somewhat brown, containing some mucus, but was not of a fecal odor. There had been no bowel movement since pain began, and no attempt to cause any by enema had been made. When first seen (by Dr. Mitchell shortly before admission) the child was quite sick. He had a strong cry, the skin was loose, showing evidence of rapid loss of weight and fluids. The throat, heart and lungs were normal. The abdomen was soft and scaphoid, not tender, and presented in the lower portion, median line below the umbilicus, a visible and palpable sausage-shaped tumor 2 inches by 3½ inches, apparently in the region of the small intestine. Rectal examination revealed no tumor, but blood and mucus were voided. There was no history of frequent bloody and mucus stools, the bowels being closed since the development of the pain and vomiting. This is significant in view of the operative findings.

On admission to the hospital the temperature was  $100\frac{3}{5}^{\circ}$ ; pulse 152; respirations 38. Operation the same evening under ether anæsthesia. A right rectus incision downward from the umbilicus exposed an intussusception immediately beneath the wound, which when delivered was found to be entirely in the small intestine. The exact location was not sought for or determined. The peritoneum was smooth and shining over the bowel, the deeper layers of which were dark and congested. There was marked constriction at the upper end of the tumor, the entering point of the bowel. All attempts at reduction failed, the peritoneum splitting on slight pressure when attempts were made to express the bowel from below upward. Resection was at once performed, the mesentery being cut close to the edge of the intussusception and a small-sized Murphy button used to perform end-to-end anastomosis. The snug closure was then reinforced by the Cushing

## INTUSSUSCEPTION IN AN INFANT

suture, interrupted at one point. The abdominal wall was closed by through-and-through sutures of silkworm gut. The time of operation was forty minutes, and the condition on the table at times was poor, and strychnia and camphorated oil were used hypodermically. After the operation prococlysis with glucose and soda solution was used and small amounts of nourishment given by mouth the following day. The patient vomited at intervals for the first thirty-six hours, and there were several movements which contained blood, or mucus, or both, for forty-eight hours after operation. The movements became fecal on the second day, when several dark brown liquid stools were obtained, and the vomiting practically stopped. Attempts at feeding by peptonized milk were not very successful and it was later rendered possible to obtain breast milk from one of the wet nurses employed by the hospital, which agreed well with the infant. The temperature rose sharply after operation, as is usual in these cases, reaching 105°, and declined gradually, touching the normal in six days. The promising convalescence was suddenly interrupted by an accident which threatened for a time to result fatally. This complication was due to failure of union in the abdominal wound which opened up when dressed on the seventh day, and a couple of loops of small intestine protruded from the abdominal cavity. The child was taken to the operating room and given a little chloroform, the intestines replaced, a cigarette drain inserted in the peritoneal cavity, and the wound re-sutured. It healed thereafter by granulation. The button was passed on May 20. The child was transferred to the Medical Ward for treatment by Dr. Hand on June 4, where, with the aid of breast milk, the weight chart showed a steady gain, and the patient was later sent to the country branch of the hospital from whence he was discharged June 21.

The patient was readmitted to the medical wards in Dr. Hand's service in July, with symptoms of gastro-intestinal indigestion, marked by diarrhoea, vomiting and loss of weight. Improvement was prompt, and under proper feeding the child gained 2 pounds or more in the course of a month, when he was again discharged to his home as cured. At the time of his readmission the child weighed 10 pounds 3 ounces, and at the time of his discharge 12 pounds 4 ounces. This illness was apparently the ordinary gastro-intestinal disorder of the summer months.

The length of the entire specimen removed was 23 cm. measured along the border opposite the mesentery. Of this length 7 cm. was accounted for by the collapsed section of the ileum below the tumor, extending to the point of resection of the bowel. There was a short portion of ileum resected above the point of the entrances of the intussuscipiens. The diameter of the intussusception was 9 cm. It will be seen from these measurements that between 15 and 18 inches of intestine were resected. The child, now eighteen months old, is in good condition and well nourished in spite of unhygienic surroundings and poor maternal care.

The case adds another recovery to the very small number of infants who have survived intestinal resection for irreducible intussusception. Dowd, writing in 1913, referred to eight cases besides his own remarkable

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case of recovery in an infant five days old. Reference may be made to two other cases reported by J. Fraser and Clubbe, without attempting a complete review of recent literature. In view of the rarity of recovery after resection, one might consider with favor the practice of short-circuiting the bowel by an anastomosis around the irreducible intussusception as successfully practised in two cases in children by Rutherford and Parry. The present case also illustrates the value of the Murphy button for emergency work even in infants. In four of the previously reported recoveries, a Murphy button or Mayo Robson button was used. Twice the Paul tubes were used; for a two-stage operation Dowd favors the use of needle and thread.

### CHRONIC INTUSSUSCEPTION OF THE LARGE INTESTINE IN AN ADULT

DR. JOHN H. JOPSON reported the history of a man, aged thirty-six years, who was admitted to the Presbyterian Hospital with a history of illness of two months' standing. It began as slight soreness below and to the left of the umbilicus and was associated with cramp-like pains in the same region, coming on about one hour after meals and also present and more intense at bed time. Vomiting began a few weeks previous to admission and matter vomited consisted of stomach contents and bile. Pain was not relieved by eating or medication. There was some relief from pain while lying upon the left side. The bowels at first were regular and later diarrhoea developed; sometimes eight or ten movements a day. The movements were usually greenish and liquid and never contained blood. Along with these symptoms he lost weight. When admitted abdominal distention was marked; the abdomen was tympanic, with a tender area below and to the left of the umbilicus. No mass could be felt. The abdomen was very tense, so that examination was unsatisfactory and there was no evidence of fluid. The white blood count was 6250. The patient was not acutely ill on admission. Diarrhoea was still present. No diagnosis had been arrived at during the time the patient was in the hospital but he was undergoing a systematic examination and on the third day after admission and while being prepared for X-ray examination, he developed an unusually severe attack of abdominal pain, being an exaggeration of the same type of cramps to which he was subject. He went into collapse almost at once and died within a few hours and without any sign of reaction.

At autopsy there was found a chronic intussusception in the descending colon. Probably as a result of the chronic, incomplete obstruction, a perforation had occurred, not at the site of the intussusception, but in the first portion of the ascending colon. The abdomen was full of fecal contents and death was due to shock and peritonitis. When the intussusception was opened, there was found at the apex of the intussuscepted bowel what was at first thought to be a pedunculated growth. It was only on microscopic section of the same and after a study of several sections that Dr. Pfeiffer, pathologist to the hospital, pronounced this mass to be a portion of the parietal wall of the inverted bowel.

## LARGE FIBRONEUROMA OF THE MEDIAN NERVE

### LARGE FIBRONEUROMA OF THE MEDIAN NERVE

DR. JOHN H. JOPSON presented a male negro, aged forty-five years, who was admitted to the Bryn Mawr Hospital in January, 1917, with the history that about thirty years ago he had noted a small swelling on the inner side of the left arm following a slight traumatism, which gave him no pain and was not tender on pressure. It underwent a very gradual enlargement. He paid little attention to it until about three months ago, when he began to have pain in the arm and a stinging, tingling sensation in the ring and little fingers. The patient was an exceptionally well-developed and well-nourished negro, otherwise in good health. There was a large, hard, round, symmetrical tumor the size of a small fist on the inner side of the left arm overlying the vessels midway between the axilla and the elbow. It was slightly movable and lay to the inner side of the biceps muscle and apparently was not attached to it. It was not tender on pressure nor did examination cause any pain in the distribution.

At operation the outer portion, or what might be designated the capsule of the tumor, was found to be made up of many layers of what appeared to be smooth, fibrous tissue. The tumor was situated in the course of the median nerve which entered it at its upper and left it at its lower pole. Each layer of the above-mentioned capsule was split and dissected back with care to avoid injuring the nerve fibres. Examination showed that the fibres of the nerve spread out after reaching the growth, and when the innermost layer was divided the tumor could be peeled out entire without cross-sectioning any nerve tissue. The sac that remained bore very much the same relationship to the unaffected portion of the median nerve that the sac of an aneurism does to the artery after incision. The layers of the sac were then infolded so as to obliterate it, using small catgut sutures, and the arm was dressed upon a splint.

Following the operation the patient was found to have a loss of sensation on the palmar surface of the index and middle fingers and the first phalanx of the dorsal surface. There was also loss of flexion of the thumb and index finger. He was discharged from the hospital February 4, 1917.

When he reported for examination five weeks later there was a soft swelling four inches long and two inches wide in the site of the tumor. He has still what he describes as "a sore feeling" along the course of the median nerve from the elbow to three inches above the wrist. Anæsthesia persists on the flexor surfaces of the thumb and index finger, across the palm to a point about one inch above the base of the third finger, the palmar surface of which is also anæsthetic. The dorsal surface of the index and of the middle finger is affected as far as the first joint. There is a small area of anæsthesia on the radial side of the last phalanx of the fourth finger. Muscular power in the thumb is largely regained. There is still some loss of flexion of the proximal phalanx and flexion is lost in the index finger. The patient is receiving electrical treatment at the present time.

The pathological report of the tumor is as follows:

Microscopic examination of sections taken from the wall of the tumor shows a dense connective-tissue stroma which contains relatively few cells and has

## PHILADELPHIA ACADEMY OF SURGERY

undergone hyaline degeneration. The tissue is well vascularized and in a few places rather large blood-spaces are noted. There are areas in which lime salts have been deposited, minute areas containing blood pigment are seen, and considerable amounts of blood extravasation are present. Small foci of necrosis appear; these areas are found toward the innermost degenerated portion of the tumor. The major portion of the growth is composed of the dense fibrous stroma noted. Microscopic examination suggests a fibroma which has undergone the various degenerations noted.

This specimen represents a rare type of tumor, namely, a solitary neurofibroma of unusual size, originating from the endoneurium. Solitary neurofibromata of this type present the picture of a slowly-growing benign tumor which, according to Woolsey, not infrequently undergoes either myxomatous, cystic or fatty degeneration, and less commonly sarcomatous change. The multiple type of neurofibroma is more common than the solitary variety. Neurofibromata may reach the size of a grape fruit. They are sometimes hereditary, and more often congenital; the plexiform variety almost always so.

The appropriate treatment of endoneurial tumor of the solitary type is incision of the enveloping nerve sheath along the course of the nerve fibres, carefully avoiding division of the same, until the adventitious capsule of the tumor is passed and the tumor itself is reached and can be enucleated. This was the procedure practised as far as possible in this case, but, as is evident, there was some disturbance of function of the nerve despite the care which was exercised. This condition is improving and if no recurrence of the tumor takes place, will probably be almost, if not entirely, overcome.

### ULTIMATE RESULTS OF NEPHROPEXY

DRS. JOHN G. CLARK and FRANK B. BLOCK read a paper with the above title, for which see page 479.

DR. GEORGE ERETY SHOEMAKER said that one of the essential conditions in dealing with kidney prolapse is that the operation be undertaken for definite symptoms due to the kidney mobility and not because the kidney moves. Many of his patients had been treated satisfactorily with the corset alone. In several instances other operations have been done; for example, repair of lacerations or Coffey operation, but it has been possible in nearly all instances to separate symptoms due to the other conditions.

The operation has a somewhat limited place but a definite one; it will relieve certain very definite distress from dislocation of the kidney which produces in its aggravated form the Dietl's crisis and certain indefinable sensations of unrest which appear only in the upright position and which disappear with kidney support. The situation in life of some women prevents their wearing through the day an efficient corset.

In 1906 he published in the *Journal of the American Medical Association* a suggestion for the modification of the technic of kidney-fixation which was intended to be added to suture methods and all other methods of support which might be advised. It consists essentially in delivering the kidney as usual through the torn fascias and fatty capsule, then closing the opening

## EXCISION OF THE HEAD OF THE HUMERUS

from which the kidney emerged by catgut sutures of the fat and fascia below. It will now be found that the kidney cannot be put back into the body; a new bed for it is made by blunt dissection close to the muscles of the back and above the incision, after which the usual method of suture of the kidney to the parietes is carried out and the external wound is closed. Where this technic can be carried out he believed that a better support is obtained and a better cushion of fat formed below the kidney. This does not interfere with any other technic, but is an addition to it.

He had notes on 21 cases of suspension of the kidney within the last seventeen years. Within the short time since receiving notice as to this discussion, he had been able to hear from and examine several of these and the condition of all except 5 is known. All recovered from the operation. One, performed seventeen years ago, is known to have relapsed; she, however, had a greatly relaxed and pendulous abdomen; has had 4 children since the operation. She was relieved of very severe attacks of dislocation with kidney prominence, extreme pain accompanied on one occasion by bloody urine; eleven years later there was but little descent of the kidney, but at present it has a large range of motion, although there are no crises.

One patient, with no other trouble, operated eleven years ago, writes: "I have no discomfort; have since married, and have two children, and attribute present well-being to the operation."

Another examined a few days ago was operated in 1903 (fourteen years ago); she has had 3 children since; does more work than ever before and is "feeling splendid"; present weight 145 pounds. Before operation the left kidney was below the navel; she had crises of abdominal pain usually produced by exertion; several attacks with a palpable lump over the kidney and severe pain. She was symptomatically cured and remains so to date. In this case part of the fatty capsule was removed.

Another extremely grateful patient has regained her health completely, but in addition to the kidney suspension she had a Coffey operation for viceroptosis. The right kidney was 2 inches below the navel. She has regained her health and capacity to work as a foreign missionary. She remains well; kidney was examined more than a year after fixation and found in good position.

In his general experience there has been little occasion to regret the operation largely because the cases have been selected. As far as known there has been only one absolute failure to secure improvement beyond a few months; this was in a young working woman of a highly neurotic temperament and probably many other elements entered into the condition. At the present time probably this operation would not be done.

In conclusion one might say that it is an operation to be undertaken only after careful study and where other measures have failed to afford relief; but in the selected cases it is well worth while.

## EXCISION OF THE HEAD OF THE HUMERUS

DR. T. TURNER THOMAS read a paper describing a new method of excising the head of the humerus, for which see page 492.

TRANSACTIONS  
OF THE  
NEW YORK SURGICAL SOCIETY  
*Stated Meeting, held April 11, 1917*

The President, DR. CHARLES N. DOWD, in the Chair

LARGE FECOLITH IN THE APPENDIX

DR. WILLIAM A. DOWNES presented a man, twenty-two years of age, who was admitted to St. Luke's Hospital on March 11, 1917, with a history of pain in the abdomen, of two days' duration; cramp-like in character. Temperature 100.4°; pulse, 94; blood count showed leucocytes 24,000, with 90 per cent. polynuclears.

At the outset the pain was referred to the penis and at frequent intervals during the two days he had considerable pain in the bladder. The morning after admission his temperature had gone down to 99°; pulse 84.

The diagnosis of acute appendicitis seemed most probable, but operation was deferred as the symptoms were subsiding. On account of the pain radiating to the bladder X-ray was taken, and it showed a definite shadow in the pelvis. This shadow was very large for an ureteral calculus, but a ureteral catheter was passed and a differential picture taken. It showed very distinctly that the catheter passed to one side of this shadow. This confirmed the diagnosis of fecolith.

On the third day after admission to the hospital, his temperature rose to 101°, and the abdomen became considerably distended. Dr. Derby operated and found an enormously distended appendix containing a fecolith the size of a filbert.

DR. CHAS. DOWD, in discussing Dr. Downes' case, referred to one in whom he had recently found clearly marked X-ray shadows from a large fecolith in a left-sided appendix. The symptoms had suggested a diverticulitis of the descending colon but X-ray pictures of the kidney tract were taken and the shadow of a large fecolith was found on the left side of the abdomen—once low and once high. This was verified at operation.

SARCOMA OF LEG, WITH INTRACRANIAL METASTASIS:  
SPONTANEOUS DECOMPRESSION

DR. DOWNES presented a girl, ten years of age, who was admitted to St. Luke's on June 7, 1916. Her chief complaint at this time was pain in the occipital region, of six weeks' duration—constant, dull and non-radiating. Four years ago Dr. Downes had amputated the left leg at New York Hospital, on account of a pathological tumor which proved to be round-celled sarcoma.

When admitted to St. Luke's, Dr. Cutler examined the eyes, and found

### CRANIOTOMY FOR CEREBELLAR CYST

vision 15/30 in. in right eye and 11/30 in. in left. Both eyes showed choked discs. He urged very strongly a decompression operation. It was agreed that there was in all probability an intracranial recurrence from the leg sarcoma. The family refused operation and she was discharged. Readmitted to the hospital on February 17, 1917. At this time she came in on account of a swelling 5 cm. in diameter in the back of the head. This swelling was situated just at the left of the median line in the occipital region, was moderately tender, and seemed definitely attached on its under surface to the bone. Otherwise the physical signs were negative. Temperature at this time was 98.3°; pulse 98.

The X-ray picture at this time showed very distinctly a deficiency in the bone at this region. In the meantime, between her previous admission to the hospital in June, 1916, and February, 1917, at some time along about September, her headaches began to get less. Her eye symptoms at the time of this last examination were practically the same as before. They showed very little improvement over previous examination. She was sent to the Memorial Hospital, where she had one application of radium, and was given Coley's toxin. At the present time the local evidence of the tumor has disappeared, which is of little significance when it comes to giving a prognosis as to the future progress of the case.

The case was shown for the purpose of calling attention to the late recurrence—four years after amputation for sarcoma—and the relief of headache as a result of the spontaneous decompression.

### CRANIOTOMY FOR CEREBELLAR CYST

DR. CHARLES A. ELSBERG presented a girl seventeen years old, who entered the Neurological Institute on the service of Dr. Peterson in January, 1917. Eight months before she began to be unsteady in walking and to have attacks of headache and vomiting. Two months later she developed diplopia and her vision began to fail. When she was admitted to the hospital she was bedridden, was extremely ataxic and unable to raise her head from the bed without having an attack of vomiting. Physical examination showed that there was marked choked disc with all the signs of an affection of the left lobe of the cerebellum.

Dr. Elsberg did a bilateral suboccipital craniotomy on January 13, 1917. The left cerebellar lobe bulged very markedly when the dura was incised, while there was no increase of tension on the right side. Aspiration of the left cerebellar lobe withdrew dark yellow fluid. An incision 3 cm. long was made and about 5 c.c. of fluid evacuated. There was no evidence of a capsule. The wound in the cerebellum was left wide open and the soft parts closed in the usual manner. Convalescence from the operation was uninterrupted; the wound healed by primary union. The headache disappeared at once, the eye grounds returned to normal within two weeks. All of the ataxic symptoms grew rapidly less and when she was discharged on March 6 she was free from all symptoms.

The case was evidently one of a simple cyst of the cerebellum.

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### ABSCESS OF THE FRONTAL LOBE FOLLOWING ORBITAL CELLULITIS

DR. ELSBERG presented a boy thirteen years of age, a private patient of Dr. Peterson, who was admitted to the Neurological Institute in a much emaciated condition. Two months before, an abscess of the right orbit had been opened; he had recovered satisfactorily from this operation. Three weeks later he began to complain of right-sided headaches and then to lose strength and flesh rapidly. He had frequent attacks of vomiting, and a complete ophthalmoplegia of the right side. When admitted to the hospital his condition was very poor. He was pale and emaciated; there was considerable rigidity of the neck and decided Kernig, and he had the appearance of a patient suffering from tubercular meningitis. He had, however, a double choked disc with slight left facial weakness, and the possibility of a brain abscess was considered. Soon after his admission to the hospital he had a convulsive attack affecting the face and upper limbs; following this there was slight weakness of the left upper extremity. A few hours later he had another attack, after which the left upper extremity and the left side of the face were paralyzed. Within a few hours the patient became stuporous so that the right frontal lobe was explored without delay. A vertical incision was made in the right frontoparietal region. A button of bone removed with a trephine, the dura incised, and the brain aspirated. At a depth of 3 cm. below the cortex thick green pus was obtained. Packings soaked in iodine were placed all around the wound and the exposed brain painted with tincture of iodine. The lobe was then incised and about 6 oz. of pus under marked pressure were evacuated. The frontal lobe was drained with two tubes. Convalescence from the operation was very rapid.

The patient was discharged entirely well, free from all symptoms, two months after the operation. When discharged, the eye-grounds were normal and the ophthalmoplegia had entirely disappeared.

Dr. Elsberg stated that there were some surgical principles in the treatment of brain abscess which were often neglected. A brain abscess should always be drained by two tubes and these tubes should never be removed at the dressings, but should be gradually shortened. If, before an abscess of the brain is opened, packings of gauze soaked in tincture of iodine are placed under the dura all around the wound there is practically no danger of meningeal infection. The drainage tubes should be held in place by sutures to the scalp, so that they can neither be pushed further into the brain nor become displaced in an outward direction. If these general surgical principles are followed, drainage of an abscess cavity in the brain can be carried out satisfactorily. It is wrong to remove a drainage tube from the brain and then attempt to reinsert it, because one can seldom get it into the same place again. In such attempts, the neighboring brain tissue will be sure to be injured.

### EXTRAMEDULLARY SPINAL CORD TUMOR

DR. ELSBERG presented a man in whom he had removed a spinal cord tumor from the level of the twelfth dorsal segment in December, 1916. The

#### NEUROFIBROMA IN THE CEREBELLO-PONTINE ANGLE

patient presented all the symptoms of a growth at this level, but operation was much delayed on account of a history of syphilis and a positive Wassermann reaction. The tumor removed was a typical glioma and the patient recovered very satisfactorily from the operation.

There is no reason why a patient cannot have syphilis and at the same time a spinal cord tumor, and this has been the case in several patients operated by the speaker.

Whenever, in a patient with a positive Wassermann the symptoms of spinal compression are not quickly improved by antispecific treatment, operation should be performed without delay. The patients with spinal cord gummata usually improve very rapidly after the first salvarsan treatment, as occurred in a patient recently seen by the speaker. If the symptoms do not rapidly improve, it means that either the gumma is so large that its actual removal is indicated or that the growth has nothing to do with the systemic syphilis. It is wrong to permit a patient to become paraplegic while antispecific treatment is being tried. If treatment does not show immediate improvement, and if the spinal symptoms grow worse, the surgeon should not hesitate but should proceed to operative treatment without delay.

#### NEUROFIBROMA IN THE CEREBELLO-PONTINE ANGLE

DR. ELSBERG presented a man fifty years of age from whom he had removed a tumor from the cerebello-pontine angle fourteen months before. When the patient was admitted to the Neurological Institute he gave a typical history and the characteristic signs and symptoms of a tumor in the right cerebello-pontine angle. He was operated in February, 1916, a bilateral suboccipital craniotomy being performed, and the tumor enucleated inside of the capsule. The patient had recovered nicely from the operation and his symptoms had gradually improved up to the present time.

The patient was presented in order to call the attention of surgeons to a method of removal of these tumors which has been very satisfactory, and which has markedly lessened the mortality from these operations. Small tumors (up to the size of a cherry) in the cerebello-pontine angle can be safely removed with their capsule. Large tumors are usually closely adherent to the sides of the pons and medulla, and their removal *with* the capsule is very apt to cause a secondary softening of these structures. A slight hemorrhage in this region is only too apt to result fatally. Neurofibromas in the cerebello-pontine angle grow very slowly and are clinically benign. They do harm only by pressure. It does no harm to leave the capsule behind. Therefore if, when such a tumor is exposed, it is found to be of large size, no attempt should be made to remove it with its capsule, but an incision should be made into the capsule, and with a sharp curette all the tumor should be scraped away. Although the capsule is usually fairly tough, care must be taken that the capsule

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is not perforated. All the manipulations should be done with gentleness, and special care should be taken when curetting out the mesially placed portions of the growth.

By this method, all of the tumor is removed within its capsule and the capsule is allowed to remain behind. The intracapsular enucleation of tumors in the cerebello-pontine angle is a very satisfactory method of procedure, and the large majority of the patients recover from the operation.

### EXTRAMEDULLARY SPINAL CORD TUMOR

DR. ELSBERG presented a patient forty-eight years of age who was admitted to the Neurological Institute with all the signs of extramedullary compression of the cord at the sixth dorsal level. Two years before, the patient began to have attacks of pain over the left hip. Soon after, she began to have difficulty in walking, both limbs becoming stiff, weak and numb. For three and one-half months she had lost complete power in the lower limbs with incontinence of urine and faeces.

Physical examination showed sensory and motor signs up to the sixth dorsal segment. Operative interference was considered urgent. At the operation an extramedullary tumor the size of an almond was removed from the posterior surface of the cord. The growth was a typical endothelioma and very hard in consistency. Convalescence from the operation was uneventful; in spite of the three and a half months paraplegia, return of power began very early. Ten days after the operation she was able to move the right leg somewhat and soon afterwards began to regain control in the left leg. Four weeks later she had regained complete control of the bladder and rectum. When she was seen last, five months after the operation, all sensory and motor disturbances had disappeared and she was entirely well.

Dr. Elsberg stated that the small hard growths are much more apt to cause an early and irremediable injury to the cord than the larger and softer ones. In the speaker's experience the larger the tumor that was removed, the less the injury to the cord. He had seen a number of patients with small, easily removable growths in whom the paraplegia had persisted in spite of removal of the growth.

### SPINA BIFIDA

DR. ELSBERG presented a patient upon whom he had operated over a year ago for a ruptured spina bifida in the mid-dorsal region. The child was operated when it was three days old. It recovered entirely from the operation, and was presented well and strong. In connection with this case, Dr. Elsberg mentioned the fact that he had seen and operated upon quite a number of infants with ruptured spina bifida, but in only one of them had a meningeal infection occurred. Several of the patients were operated one to two weeks after the rupture of the sac. It seems that meningeal infection is less apt to occur in infants, and Dr. Elsberg asked whether this had been the experience of other members of the Surgical Society.

## SPINA BIFIDA

DR. WILLIAM G. DOWNES said that he had operated on a very large spina bifida in the lumbosacral region forty-eight hours after rupture, which made a perfect immediate recovery. Yet he had seen two or three others brought into the hospital rather late that had died from the meningeal symptoms, in which there were other conditions which made it unwise to perform any operation.

DR. CHAS. N. Dowd, in speaking of spina bifida, referred to one of these children whose sac had been ruptured for two days and in whom excellent closure was obtained by the turning in of fascial flaps.

He also asked whether any of the members of the Society had seen cases of spina bifida who developed into normal children. Some of the pediatricists claim that such development cannot be expected.

DR. DOWNES quoted a case of about four years' standing where he removed a large meningocele in the upper dorsal region that had apparently remained well. However, he had done several others that he thought were just as favorable and they had developed hydrocephalus in a short time. He knew certain pediatricists who doubt the advisability of operating on any case of spina bifida on account of the tendency to develop hydrocephalus.

DR. ARTHUR L. FISK had seen within the last week a child four months old, who has a meningocele high up in the cervical region. In fact there are two, one, a small sac about the size of a large olive, which is shrivelled and covered by a thin parchment-like skin over its apex; the second is a sac as large as a Tangerine orange; the skin covering this is thin in spots, showing fluid beneath, but elsewhere it is thick, very like scar tissue. When the child cries no impulse can be felt in either sac. The anterior fontanel is closed. He had advised against operation at the present time because nature seemed to be gradually obliterating the communication between the spinal canal and the sacs, in a safer and simpler manner than by surgical interference. The child did not show any evidences of paralysis and it was apparently bright mentally.

DR. ALFRED S. TAYLOR said that it had always seemed to him that the statement that is made in the books that hydrocephalus follows the operation should not be put in just that way. It is true that very frequently operation upon spina bifida precedes hydrocephalus, but it is his belief that the hydrocephalus is a thing that would be developing anyway and that the hydrocephalus and spina bifida are both of them the result of some fundamental disturbance in the formation of the child and that the closure of the sac has practically nothing to do with the development of hydrocephalus except that it precedes it in time.

He had operated on one or two spina bifidas where hydrocephalus was already present, perfectly definitely developed. The operation was not done for any other reason than simply to make the child easier to take care of mechanically. In those cases the spina bifida was a protrusion, a couple of inches backward from the spine, and it was necessary to cover it with a big ring, so that it would not be ruptured. The feet and legs were powerless and more or less deformed and spastic, and it was explained carefully to the

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parents that the operation was done for purely mechanical effect rather than for any other purpose—as it would render easier the care of the child during its life.

DR. ELSBERG remarked that he had tried—based on the newer ideas of cerebrospinal fluid circulation—to explain the occurrence of hydrocephalus. He did not think that ventricular distention after operations for spina bifida is due to the operation, but it is apt to be made worse by the operation. He has tried to explain the occurrence of hydrocephalus in infants with spina bifida in the following way:

It is now known that the circulation of spinal fluid follows a certain definite course. The fluid flows down on the posterior side of the cord and passes up on the anterior surface of the cord. There is a valve-like arrangement of the arachnoid on the anterior surface near the foramen magnum which favors the passage of fluid upward, so that in general there is a current of cerebrospinal fluid downward on the posterior and upward on the anterior surface of the cord. Now, if there exists a spina bifida, there is an obstruction to the passage of the cerebrospinal fluid past that point, which is probably very often made worse if the patient is operated. There is then an obstruction to the flow of the fluid (which is sooner or later followed by hydrocephalus) and this obstruction is likely to be increased by the operation.

He always determines whether the absorption from the subarachnoid space is normal by means of the phenolphthalein test. If subarachnoid absorption is normal, then he considers the hydrocephalus to be a real obstructive hydrocephalus. Instead of being in the iter or the foramina of Magendie and Luschka, the obstruction is lower down in the spinal canal. In such patients he does a puncture of the corpus callosum. After this procedure he had had a considerable number of patients with spina bifida who were well after five, six, seven or eight years. For all of these reasons, he considered the hydrocephalus that follows spina bifida a true obstructive hydrocephalus.

### GIANT DUODENUM

DR. WILLIAM A. DOWNES read a paper with the above title, for which see page 436.

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